SUMMARY

S 1.0 INTRODUCTION

The U.S. Department of Energy (DOE) proposes to construct and operate an accelerator-based research facility called the Spallation Neutron Source (SNS). This facility would provide the U. S. scientific community with a neutron source having greater intensity, power, and instrumentation than existing neutron sources. It would augment the research capabilities of current reactor-based neutron sources, satisfy current and future demand for research neutrons, lead to new scientific and technological discoveries, and meet international technological and economic challenges.

DOE has identified four siting alternatives for the proposed SNS. These are as follows:

- Oak Ridge National Laboratory (ORNL) Alternative (Preferred Alternative), Oak Ridge, Tennessee.
- Los Alamos National Laboratory (LANL) Alternative, Los Alamos, New Mexico.
- Argonne National Laboratory (ANL) Alternative, Argonne, Illinois.
- Brookhaven National Laboratory (BNL) Alternative, Upton, New York.

This summary provides a synopsis of the main text of the final Environmental Impact Statement (FEIS) for construction and operation of the SNS. The EIS complies with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.); the President's Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508); and the DOE regulations for implementing the NEPA requirements (10 CFR 1021). The EIS presents the public and DOE decision-makers with a balanced and objective analysis of the potential environmental effects that would result from implementing the proposed action and alternative actions. The summary of the FEIS covers the following subjects: (1) purpose and need for agency action, (2) proposed action and alternatives, (3) descriptions of siting alternatives for the proposed action, (4) issues of public concern, and (5) environmental consequences.

S 1.1 PURPOSE AND NEED FOR AGENCY ACTION

The United States needs a high-flux, short-pulsed neutron source to provide its scientific and industrial research communities with a much more intense source of pulsed neutrons for neutron scattering research than is currently available. This source would assure the availability of a state-of-the-art neutron research facility in the United States in the decades ahead. This facility would be used to conduct research in areas such as materials science, condensed matter physics, the molecular structure of biological materials, properties of polymers and complex fluids, and magnetism. In addition to creating new scientific and engineering opportunities, this next generation neutron source would help to replace the capacity that will be lost by the eventual shutdown of existing sources in the first half of the next century as they reach the end of their useful operating lives.

The neutron science community has long recognized the need for both high-intensity, pulsed (accelerator-based) neutron sources and continuous (reactor-based) neutron sources. The two types of sources are complementary. For many scattering techniques, having neutrons available in a series of pulses is preferable to having them in a continuous beam. In addition, pulsed sources can generally produce pulsed beams with a much higher peak intensity than those available from comparable sized reactor-based sources. This enables scientists to carry out a number of important flux-limited experiments. In recent years, steady improvements in accelerator technology have made it possible to design and construct sources that can produce even more intense neutron pulses. A next-generation neutron source with a proton beam power of 1 MW would initially produce pulses with a neutron intensity more than five times higher than those obtainable from today's best operational spallation source, Isis, in the United Kingdom.

A valuable feature of a pulsed spallation neutron source is the ability to tune the beam of neutrons for particular experiments (the time-of-flight technique). Each pulse of neutrons from the proposed SNS would contain neutrons with a range of energies. The energy level of the neutrons could be determined by noting the length of time it takes for the neutron to travel from the source to the detectors. The high-energy (faster) neutrons would reach the sample ahead of the medium-energy neutrons, and the lowest-energy (slower) neutrons would reach the sample last. Because the neutrons with varying energies would be spread out over time as they reach a test specimen, the researcher could tune the neutron beam by selecting the energy level of interest by simply turning the detectors on and off at the appropriate time. Time-of-flight techniques enable the collection of many data points for each pulse of neutrons reaching the sample. Experience has shown that neutron pulses lasting approximately 1 Φs (one millionth of a second), each with a pulse occurring from 10 to 60 times per second, are optimal.

There are approximately 20 major neutron sources worldwide that produce neutron beams for materials research. Although these facilities are primarily located at large government-owned science laboratories, small research teams based at universities, research institutes, and industrial laboratories typically carry out neutron scattering experiments at these centers. The majority of users require recurrent, short-term access to the facilities, often for no more than a few days at a time. The research carried out at these sources contributes to the scientific and technological infrastructure in their regions and also contributes toward their industrial competitiveness.

Based on the conclusions of the Organization for Economic Cooperation and Development (OECD) Neutron Science Working Group,[1] which has studied this topic since 1996, there is a growing disparity between the worldwide need for neutron scattering research and the availability of facilities (reactor and spallation sources) to meet these needs. It was estimated that as the oldest sources continue to age, only about one-third of the present sources would remain available by 2010. The next generation neutron sources are then needed not only to create new scientific and engineering opportunities but also to replace out-dated capacity. In the United States, the shortfall in

[1] OECD 1998, *OECD Megascience Forum: Neutron Sources Working Group*, Document available from DOE-HQ database (DRAFT NSWGREP13.DOC), May.

neutron scattering resources compared with growing research demand and the lag in experimental capabilities compared with newer and more extensively upgraded foreign facilities have been major concerns for over ten years. As stated most recently in the Kohn[2] and Russell[3] panel reports, the present U.S. sources are inadequate to meet the needs of the American scientific community, both in terms of flux and availability. The current generation of neutron sources in the United States. has lower neutron beam intensities, lower operating powers, and less advanced measuring instruments, when compared to what is currently technologically feasible and desirable.

Given the long lead time from starting conceptual design to the commissioning of a new source (at least 10 years), decisions on new facilities are necessary in the next few years and certainly before 2005. Access to European and Japanese neutron sources by U.S. researchers and manufacturers is difficult, unreliable, and costly. The logistics of scheduling time and configuring instrumentation to conduct specialized experiments are prohibitive because of the commuting distances to these facilities. Because of its proprietary nature, much of the research desired by U.S. industry simply cannot be carried out at foreign facilities.

Scientific discoveries and the new technologies derived from neutron scattering research have contributed significantly to the development of new products for sale in the international marketplace. These include the following: better magnetic materials for recording tapes and computer hard drives; improved engine parts; better oil additives; light-weight, durable plastics; metallic glasses; semiconductors; optical systems; higher-strength magnets for electric generators and motors; thin films; pressure-sensitive adhesives; improved detergent and emulsification products; and new drugs. Because of the longstanding relationship between basic science and the world of business, scientific and technological advances like these have become major drivers of national economic progress and competitiveness among the industrialized nations of the world. The same type of relationship has developed between basic science and national defense. Since the end of World War II, the United States has used scientific discoveries to develop and sustain military capabilities that surpass those of potential international adversaries. These important relationships will continue into the foreseeable future.

Without future investments in major new science facilities, such as the proposed SNS, the nation's economic strength and competitiveness in the world economy, its national defense posture, and the health of its people may be jeopardized as the newest and best related technological developments are made overseas. The construction of a next-generation spallation neutron source in the United States would go far in providing a competitive edge for the nation in the physical, chemical, materials, biological, and medical sciences.

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[2]DOE 1993, *Neutron Sources for America's Future/Report of the Basic Energy Sciences Advisory Committee Panel on Neutron Sources*, DOE/ER-0576P, January, Washington, D.C.

[3] DOE 1996, *DOE Report of the BESAC on Neutron Source Facility Upgrades and the Technical Specification for the Spallation Neutron Source*, "Panel on Research Reactor Upgrades," chair, R. Birgeneau; "Panel on Spallation Source Upgrades," chair, G. Aeppli; "Panel on Next-Generation SNS," chair, T. Russell, March (unpublished, available from DOE).

A next-generation, high-flux, short-pulsed neutron source is needed to:

- Satisfy the future needs of U.S. researchers in neutron scattering science for pulsed-neutron sources with much higher intensity, more comprehensive instrumentation, better experimental flexibility, and greater potential for future upgrades than those offered by existing U.S. facilities.
- Facilitate new scientific discoveries and develop cutting-edge technologies.
- Augment the capabilities of reactor-based neutron sources.
- Replace research capacity that will be lost by the shutdown of some existing neutron sources early in the next century.

S 1.2 PROPOSED ACTION AND ALTERNATIVES

The proposed action is the specific way DOE is proposing to meet the need for a new neutron source. This FEIS assesses the environmental impacts that would result from implementing the proposed action at one of four alternative sites in different areas of the nation. It also assesses the environmental impacts that would result from the no-action alternative. Under the no-action alternative, DOE would not build the SNS at all. This section describes the proposed action, summarizes how the four siting alternatives for the proposed action were selected, identifies these siting alternatives, and describes the no-action alternative. It also discusses technological alternatives to the proposed action that were considered but eliminated from detailed analysis in this FEIS.

S 1.2.1 PROPOSED ACTION

The proposed action is to construct and operate a state-of-the-art, short-pulsed spallation neutron source comprising an ion source, a linear accelerator (linac), a proton accumulator ring, a liquid mercury target, and a set of neutron scattering instrumentation. This facility, called the SNS, would be designed to operate at a proton beam power of 1 MW and would be economically upgradable in the future to 4 MW (refer to Figures S 1.2.1-1 and S 1.2.1-2). The scope of these upgrades over the operating life of the facility is envisioned to encompass the following chronological stages:

1. Adding a second target station with its own set of instrumentation (space for this is included in the facility footprint analyzed in the FEIS).
2. Increasing the proton beam power to 2 MW by doubling the ion source output.
3. Increasing the proton beam power to 4 MW by adding a second ion source, modifying the linac, and adding a second proton accumulator ring (space for the upgrades is included in the facility footprint, and the impacts of constructing and operating a 4-MW facility are analyzed in this FEIS).

The implementation of these upgrades would depend largely on the availability of funding and cannot be predicted at this time. For the sake of completeness, however, this FEIS analyzes the effects from the SNS facility as it would be originally built at 1 MW, as well as those corresponding to its fully upgraded configuration of 4 MW. DOE will review the adequacy of its NEPA coverage for this project as each upgrade is proposed.

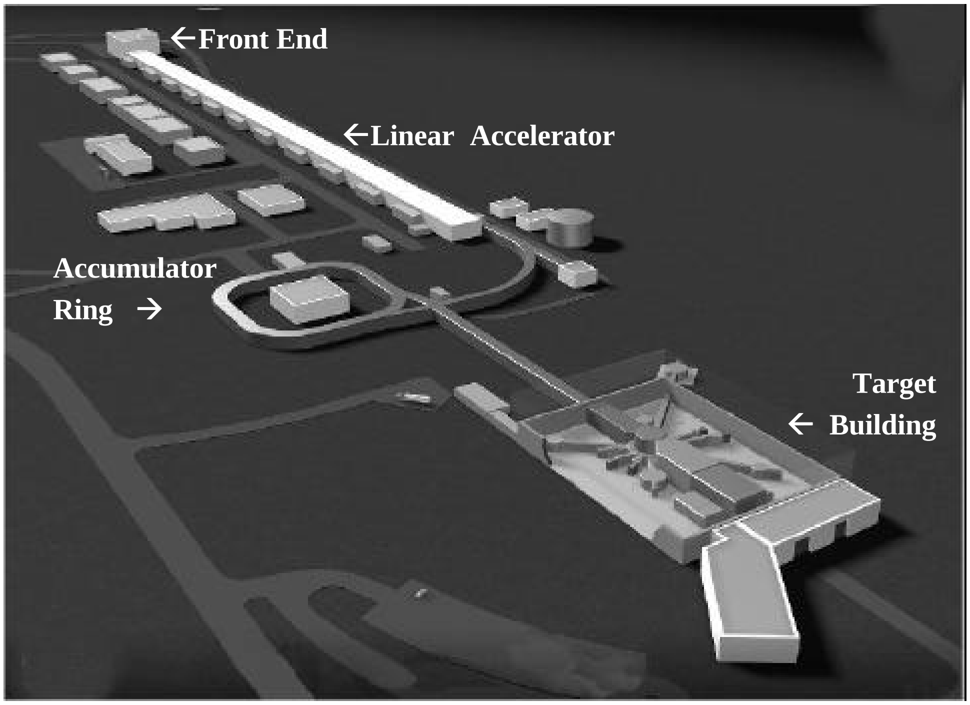

Figure S 1.2.1-1. Artist's conceptual drawing of the completed 1 MW SNS.

The following site shape and dimensions would be essentially the same for all four of the siting alternatives evaluated in this FEIS. The proposed SNS would occupy a hammer-shaped area of land containing approximately 110 acres (45 ha). Its maximum length would be approximately 4,000 ft (1,219 m), and its maximum width would be approximately 1,100 ft (335 m). At the initial SNS operating power of 1 MW, this site would contain 15 permanent buildings, including the front end, linac tunnel, Klystron building, proton accumulator ring, target building, and several facility support buildings (refer to Figure S 1.2.1-2). These buildings would cover about 6 acres (2.4 ha) of land, and their interior areas would total 364,942 ft^2 (33,903 m^2). The front end and linac tunnel would total approximately 2,000 ft in length. The linac tunnel and adjacent, parallel Klystron building would have a total width of approximately 120 ft (37 m). The initial proton accumulator ring would be about the size of two football fields laid side-to-side. The target building would measure approximately 280 ft (85 m) by 200 ft (61 m). The dimensions of the research support wing on the target building would be about 170 ft (52 m) by 60 ft (18 m). If the SNS is eventually upgraded to an operating power of 4 MW, a second proton accumulator ring and target building with the same dimensions would be added to the facility (refer to Figure S 1.2.1-2). The two-proton accumulator rings and the target buildings would be separated by respective distances of approximately 500 ft (152 m) and 270 ft (82 m).

The proposed SNS facility would produce subatomic particles called neutrons to be used in research. The production of neutrons would begin by using the linac to accelerate hydrogen atoms containing an extra electron. Then, all the electrons would be stripped off as the high energy protons enter the accumulator ring where protons are concentrated. These protons would then be directed to a target of liquid mercury.

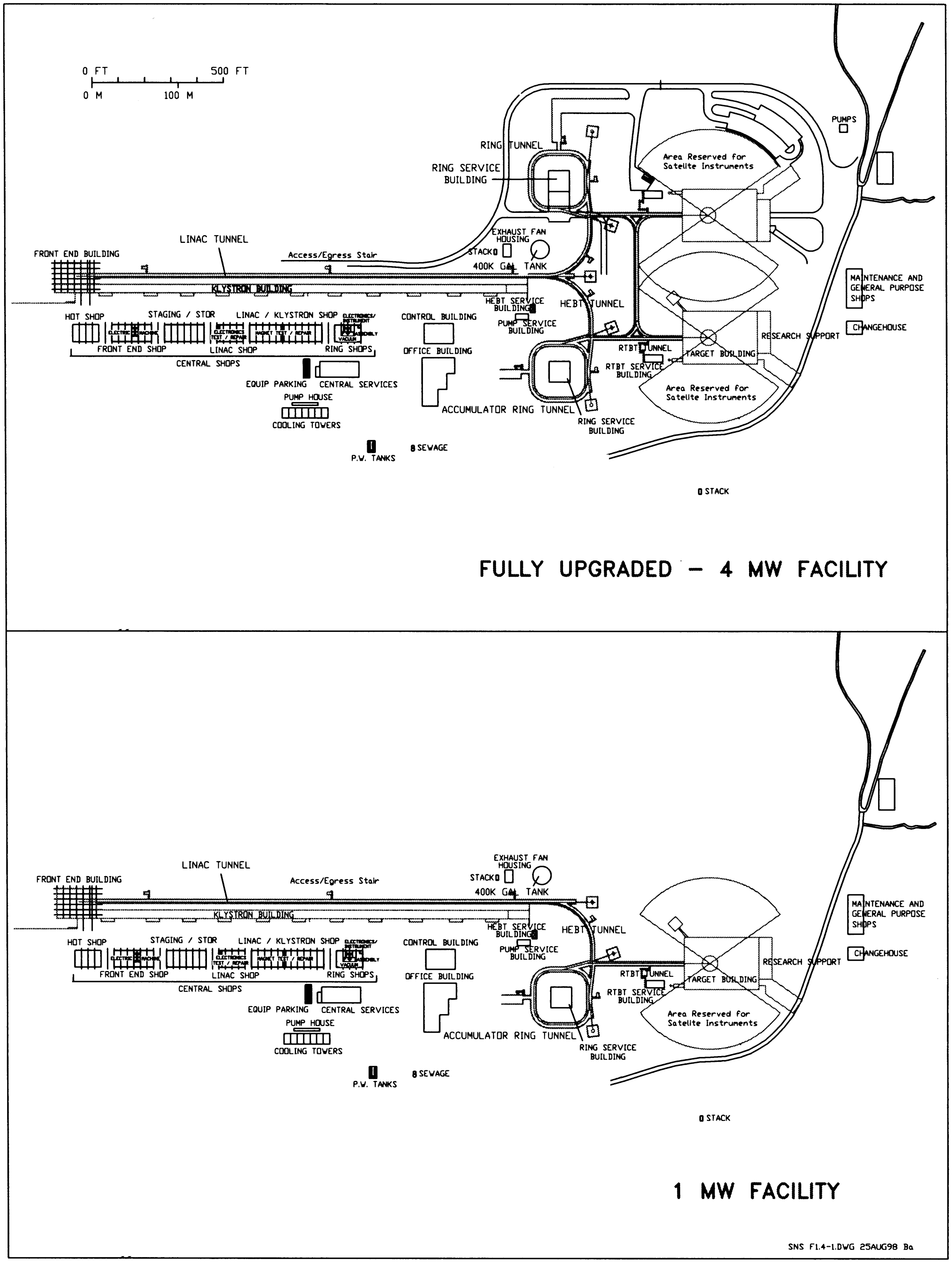

Figure S 1.2.1-2. Footprint of SNS accelerator components.

The high-energy protons would strike the mercury in the target to break-off or spall (hence the term "spallation") neutrons from its molecules. Traveling at a high rate of speed, the neutrons would be passed through a material to slow them down. Finally, the neutrons would be directed through beam tubes to experiment stations where research would be done on test materials. These neutrons would penetrate deeply beneath the surfaces of such materials to reveal their innermost characteristics.

S 1.2.2 SITING ALTERNATIVES FOR THE PROPOSED ACTION

DOE used a systematic process to select suitable alternative sites for the proposed action. The site-selection process began by identifying four major site exclusion criteria. When these criteria were defined, the process continued in two major phases. Phase 1 focused on using the exclusion criteria and other factors to identify several reasonable siting locations for the SNS at the national level. Phase 2 focused on identifying a specific alternative site for the SNS at each of these locations.

Specific SNS project requirements were used to develop the site exclusion criteria. These criteria were as follows:

- A site with a minimum area of 110 acres (45 ha) and a rectilinear shape to accommodate the length of the proposed linear accelerator and possible future expansion of the facility.
- A one-mile (1.6-km) buffer zone around the proposed SNS site to restrict uncontrolled public access and to insulate the public from the consequences of a postulated accident at the facility.
- Proximity and availability of an adequate electric power source. The regional power grid must be able to supply 40 MW of power during periods of operation. The site must be within one quarter to one mile (0.4 to 1.6 km) of existing transmission lines to minimize collateral construction impacts and costs. (It should be noted that the 40-MW power requirement was an early estimate that has since been increased to 62 MW for an SNS with a 1-MW beam and 90 MW for an SNS with a 4-MW beam.)
- Presence of existing neutron science programs and infrastructure to provide a pool of neutron science expertise and experience to meet mission goals. The site must have major facilities and programs utilizing neutron scattering techniques.

The logical universe of Phase 1 siting locations was identified and classified by DOE according to three categories: (1) existing DOE sites; (2) DOE acquisition and development of other federal property or a new, privately owned site; or (3) joint use of a nonfederal site (i.e., an academic facility). Using the exclusion criteria in combination with economic, legal, political, and public policy factors, DOE eliminated the siting locations in the second and third categories from consideration. At this point, a decision was made to limit site selection to the remaining category of existing DOE sites. Thirty-nine DOE facilities were carried forward as the universe of potential siting locations for the SNS. These 39 facilities were reviewed against the exclusion criteria. Failure of a facility to meet any of these criteria resulted in its elimination. As a result of this process, DOE identified four reasonable alternative facility locations for the SNS. These facility locations were ORNL, LANL, ANL, and BNL.

In Phase 2 of the site-selection process, each of the four national laboratories conducted its own systematic site-selection process to identify a specific site for the proposed SNS. These processes focused primarily on laboratory lands and involved the identification and evaluation of several alternative sites at each laboratory. Site-selection criteria included project requirements, environmental protection considerations, and other factors. DOE applied these criteria to the alternative sites to identify one specific site for the proposed SNS at each national laboratory.

The SNS EIS assesses the environmental impacts that would result from implementing the proposed action on each of the selected sites at the four national laboratories. These siting alternatives and their locations are as follows:

- ORNL Alternative (Preferred Alternative), Oak Ridge, Tennessee.
- LANL Alternative, Los Alamos, New Mexico.
- ANL Alternative, Argonne, Illinois.
- BNL Alternative, Upton, New York.

The preferred siting alternative for construction and operation of the proposed SNS is the ORNL Alternative. This alternative would allow DOE to take advantage of the highly trained scientific and technical staff at ORNL and the experience gained during development of the conceptual design for the Advanced Neutron Source.

The siting alternatives and the characteristics of the existing environment at each site are described in Section S 1.3 of this summary.

S 1.2.3 NO-ACTION ALTERNATIVE

This alternative describes continuation of the current (status quo) situation with U.S. neutron sources into the future, if the proposed action is not implemented. The no-action alternative would be to continue using existing neutron science facilities in the United States without construction and operation of the SNS.

S 1.2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Several different methods for producing high-power, short-pulsed beams of protons with a beam energy in the 1-GeV power range were evaluated during conceptual design of the proposed SNS. However, DOE eliminated these design alternatives from detailed analysis in this FEIS for technical reasons that would prevent them from fulfilling the purpose and need for DOE action. These design alternatives and the reasons for their elimination from detailed analysis are as follows:

- **Partial-Energy Linac and a Rapid-Cycling Synchrotron.** The partial-energy linac and a rapid-cycling synchrotron is a well understood, proven accelerator technology. However, three significant drawbacks to this approach make it unsuitable for meeting the purpose and need for DOE action. First, upgrading the facility with even modest upgrades would be a major construction project entailing the building of a second booster synchrotron to reach the proton energy necessary for the higher beam power. Second, it has limited flexibility for accommodating different pulse frequencies. Finally, it lacks the flexibility to satisfy current and probable future research needs.

- **Full-Energy Superconducting Linac with an Accumulator Ring.** The superconductivity technology incorporated into this alternative is quite mature for fabricating magnets and constructing several radio-frequency linacs. However, the existing examples of superconducting linacs are designed for electron beams that operate in a continuous wave mode, as opposed to the pulsed operation required of the next-generation neutron source. To date, anticipated problems involving pulsed operation with superconducting linacs have been identified and characterized, but they have not yet been resolved.

- **Induction Linac, Either Full-Energy or Injecting a Fixed-Frequency Alternating Gradient Accelerator.** The induction linac offers the attractive possibility of producing very short pulses of very high current without the need for an accumulator or synchrotron ring. However, no existing induction linac has accelerated protons to the energies required of the next-generation neutron source. The costs associated with designing one would be greater than for options utilizing rings, and the reliability of the high-power switches for the required service life is viewed as problematic.

  The fixed-frequency alternating gradient accelerator component of the induction linac presents some attractive features. Its most notable feature is the ability to efficiently accelerate high-current beams injected by a radio frequency linac or, most intriguingly, by an induction linac. However, as is the case with the induction linac, no fixed-frequency alternating gradient accelerator has been built in the range of performance required to meet the purpose and need for DOE action. This technology is not viewed as mature enough to be technically viable at this time.

S 1.3 DESCRIPTIONS OF SITING ALTERNATIVES

This section describes the four siting alternatives for the proposed action. Each description includes the location of an alternative site and a brief summary of existing environmental conditions on and in the vicinity of the site. These descriptions are intended to provide a brief look at each alternative site without providing a comprehensive level of detail, which would be beyond the reasonable scope of a summary. Such detail is provided in Chapter 4 of this FEIS.

S 1.3.1 ORNL ALTERNATIVE (PREFERRED ALTERNATIVE)

The preferred alternative would be to construct and operate the SNS at ORNL on the DOE Oak Ridge Reservation (ORR). The ORR is located in and around the city of Oak Ridge, Tennessee, and it contains three major facilities: ORNL, the Y-12 Plant, and the East Tennessee Technology Park (ETTP). It occupies 34,516 acres (13,974 ha) of land in Roane and Anderson counties. The location of the proposed SNS site on the ORR is shown in Figure S 1.3.1-1.

The proposed SNS site extends along a long but fairly wide and gently sloping ridge top with a broad saddle area at its eastern end. This area of Chestnut Ridge is planned for the target station and would require a minimum of excavation.

The linac and accumulator ring tunnels would be notched into the south side of the ridge using

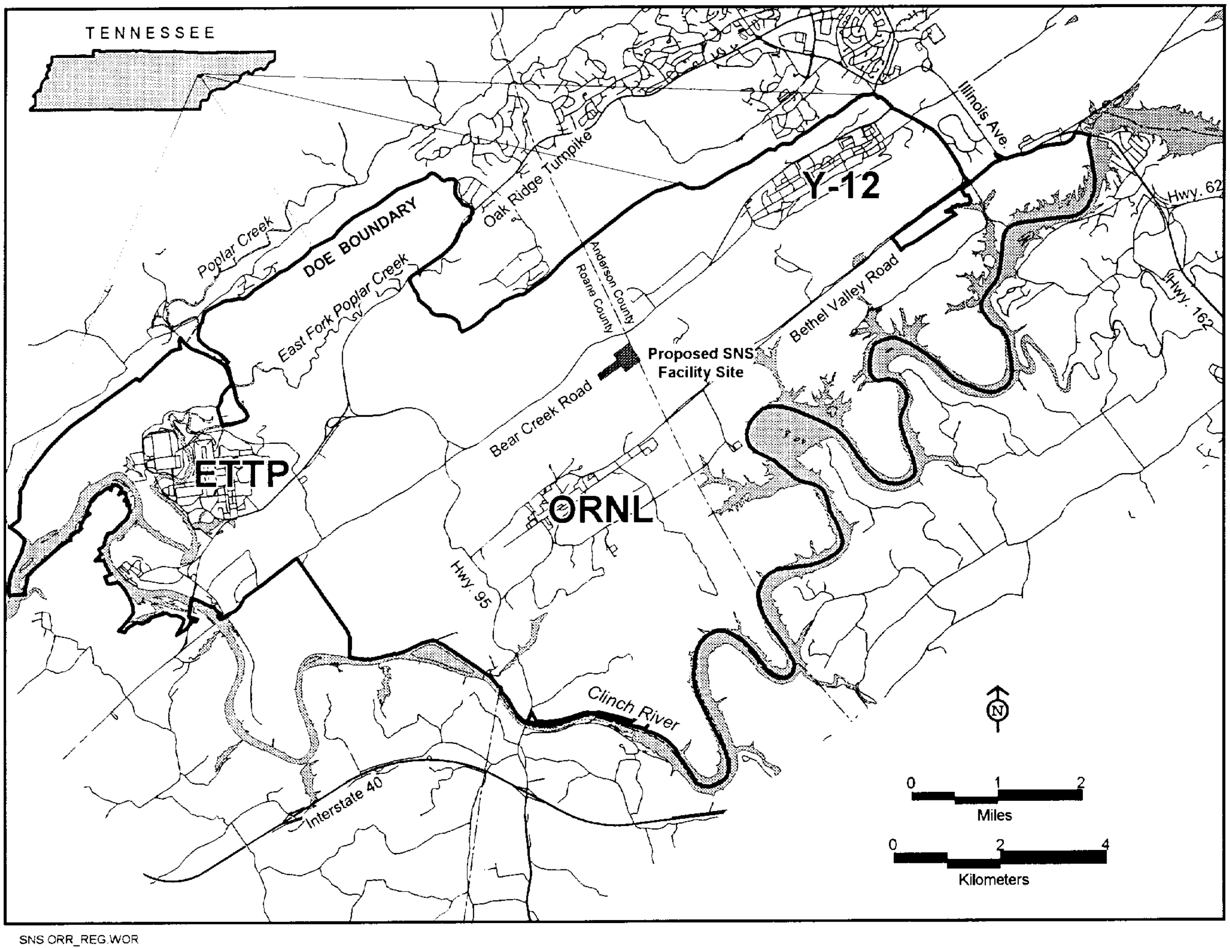

Figure S 1.3.1-1. Proposed SNS site on the ORR.

cut-and-fill techniques, providing economical construction and effective radiation shielding strategies.

Land Cover: Over half of the proposed site is covered with a mixed hardwood forest composed of red oak, white oak, chestnut oak, poplar, and hickory. Approximately 20 percent of the site is covered with loblolly pines, the majority of which were planted in the 1940s and 1950s. Approximately 20 percent of the site is labeled as “beetle kill cut over,” indicating that trees in these areas have been cut to reduce southern pine beetle infestation. The remaining 10 percent of the vegetative cover is old field scrub, which consists of first growth plant species on fields no longer used for agricultural purposes.

Protected Species: Ten protected plant species are recognized as potentially occurring within the proposed SNS site. Pink lady’s slipper and American ginseng exist at three locations very near the site. Pink lady’s slipper is a state-endangered species because of commercial exploitation. American ginseng is a state special concern species because of commercial exploitation.

Cultural Resources: No cultural resources eligible for listing on the National Register of Historic Places (NRHP) are known to exist on the proposed SNS site or in its immediate vicinity. No traditional cultural properties (TCPs) of special sensitivity or concern to the Eastern Band of the Cherokee are known to exist on the proposed SNS site or at other locations on the ORR. Because the SNS design team has not established all areas where construction or improvement of utility corridors and roads would be necessary to support the SNS, some of these areas have not been surveyed for cultural resources. The design team would establish these areas to avoid known cultural resources, and the areas would be surveyed prior to the initiation of SNS construction activities.

Land Use: The current land use category on the proposed SNS site is Mixed Research/Future Initiatives (land available for environmental research and future DOE development). The site is undeveloped land located entirely within the ORR National Environmental Research Park (NERP) and the buffer zone for the Walker Branch Watershed environmental research area.

Surface Water: The SNS site at ORNL is located entirely within the drainage basin of White Oak Creek. The headwaters of White Oak Creek begin immediately south of the site.

Wetlands: Seven wetland areas exist within the White Oak Creek watershed in the vicinity of the SNS site. An eighth wetland area is located in the riparian zone of Bear Creek South Tributary 4 and downslope from the proposed SNS site.

Groundwater: An unconfined groundwater table exists at depths approaching 100 ft (30 m) or more.

S 1.3.2 LANL ALTERNATIVE

The proposed SNS site at LANL is located on the Pajarito Plateau near Los Alamos, New Mexico. It lies on the east-central edge of the Jemez Mountains. The plateau is formed by an apron of volcanic sedimentary rocks and is dissected into a number of narrow mesas by southeast-trending canyons. The proposed SNS site would be located within a portion of the LANL reservation called Technical Area (TA)-70. TA-70 is located on a mesa flanked by Ancho Canyon 0.27 miles(0.47 km) to the southwest and a small unnamed canyon an equal distance to the northeast. To the southeast, the Rio Grande River flows through nearby White Rock Canyon at a distance of approximately 1.2 miles(1.9 km) from the proposed SNS site. Elevations within the proposed SNS site area range from 6,410 ft (1,954 m) to 6,490 ft (1,978 m). The location of the proposed SNS site at LANL is shown in Figure S 1.3.2-1.

Land Cover: The vegetation in the area of the proposed SNS site is dominated by piñon-juniper woodlands with scattered juniper savannas. Additionally, much of the land in and bordering the adjacent canyons is bare rock. Overstory plant species include piñon and one-seed juniper. Scattered grasses, primarily blue grama, shrubs, and forbs, are found in the understories.

Protected Species: No such species were identified during a surveillance survey of the proposed SNS site.

Cultural Resources: Five prehistoric archaeological sites eligible for listing on the NRHP have been identified within the 65 percent of the SNS site and an adjacent buffer zone that have been surveyed for cultural

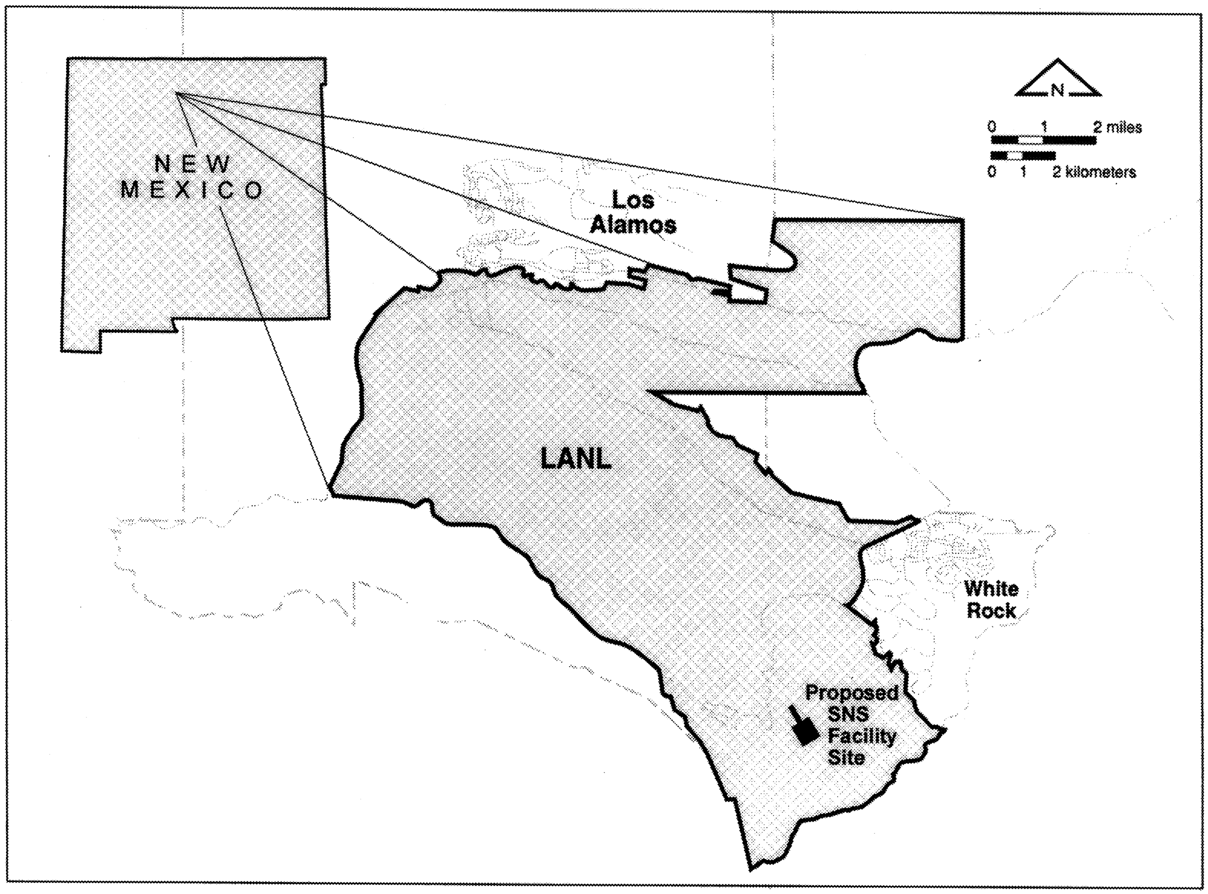

Figure S 1.3.2-1. Proposed SNS site at LANL.

resources. The remaining 35 percent will be surveyed prior to the initiation of construction-related activities, if this site is selected for construction of the proposed SNS. The DOE Albuquerque Operations Office has consulted with Native American tribes and Hispanic groups about the occurrence of TCPs on and in the vicinity of LANL land. Prehistoric archaeological sites and water resources have been identified as TCPs. However, these groups have not been consulted about the occurrence of other specific TCPs on and adjacent to the proposed SNS site. This would be done if the site is selected for construction of the SNS. Because the SNS design team has not decided where construction or improvement of utility corridors, roads, and ancillary structures would be necessary to support the SNS, these areas have not been surveyed for cultural resources. The design team would establish these areas to avoid known cultural resources, and the areas would be surveyed prior to the beginning of SNS construction activities.

Land Use: The current land use category on the proposed SNS site is Environmental Research/Buffer (available for environmental research and used as a buffer zone for LANL operations). The proposed SNS site is undeveloped open space in a remote area of the laboratory.

Surface Water: No perennial stream exists at the proposed site.

Wetlands: No wetlands exist at the proposed site.

Groundwater: The main aquifer is the primary water supply for the Los Alamos County area and could be considered a sole-source aquifer. The aquifer occurs at a depth of over 800 ft (244 m) below the ground surface.

S 1.3.3 ANL ALTERNATIVE

The proposed SNS site at ANL would lay on gently rolling land in the Des Plaines River Valley of DuPage County, Illinois, about 27 miles (43 km) southwest of downtown Chicago. Surrounding ANL on all sides is the Waterfall Glen Nature Preserve, a 2,040-acre (826-ha) greenbelt forest preserve owned by the Forest Preserve District of DuPage County, Illinois. The principal stream on ANL land is Sawmill Creek, which runs through the eastern portion of the laboratory and drains southward into the Des Plaines River. The Des Plaines River is located about 0.4 mi (0.6 km) south of ANL. The Chicago Sanitary and Ship Canal is about 0.6 mi (1.0 km) south of the laboratory. The section of the Illinois and Michigan Canal that lies within the Illinois and Michigan Canal National Heritage Corridor is located about 0.8 mi (1.3 km) south of ANL. The Calumet-Sag Channel is located about the same distance to the southeast of the laboratory boundary. The location of the proposed SNS site at ANL is shown in Figure S 1.3.3-1.

Land Cover: The predominant vegetation community on the proposed SNS site is open grassland consisting of scattered areas of old-field and intermittently mowed areas. The dominant grass species in both mowed and unmowed areas are nonnative species commonly found on disturbed soils at ANL. Scrub-shrub communities in early successional stages occur in the southwestern and southeastern portions of the proposed SNS site. These communities, which have remained relatively undisturbed in the past decade, consist of open grassland species and low shrubs that form scattered clumps of vegetation.

Protected Species: No such species were identified during a surveillance survey of the proposed SNS site.

Cultural Resources: No prehistoric or historic cultural resources are located on the proposed SNS site, but one prehistoric site (11DU207) is located adjacent to the proposed SNS site. The NRHP eligibility of this site has not been assessed by ANL. No TCPs are known to occur on the proposed SNS site. Because the SNS design team has not decided areas where construction or improvement of utility corridors, roads, and ancillary structures would be necessary to support the SNS, these areas have not been surveyed for cultural resources. The design team would establish these areas to avoid known cultural resources, and the areas would be surveyed prior to the beginning of SNS construction activities.

Land Use: The current land use categories on the proposed SNS site are Ecology Plot Nos. 6, 7, and 8 (undeveloped with no current ecological research); Support Services (old 800 Area developments); and Open Space (undeveloped). The proposed SNS site contains four active environmental restoration sites requiring additional characterization and/or remediation. Another eight sites are located relatively near or adjacent to the proposed SNS site.

Surface Water: Surface water drainage at ANL flows in a southerly direction toward the Des Plaines River, approximately 0.4 mi (0.6 km) to

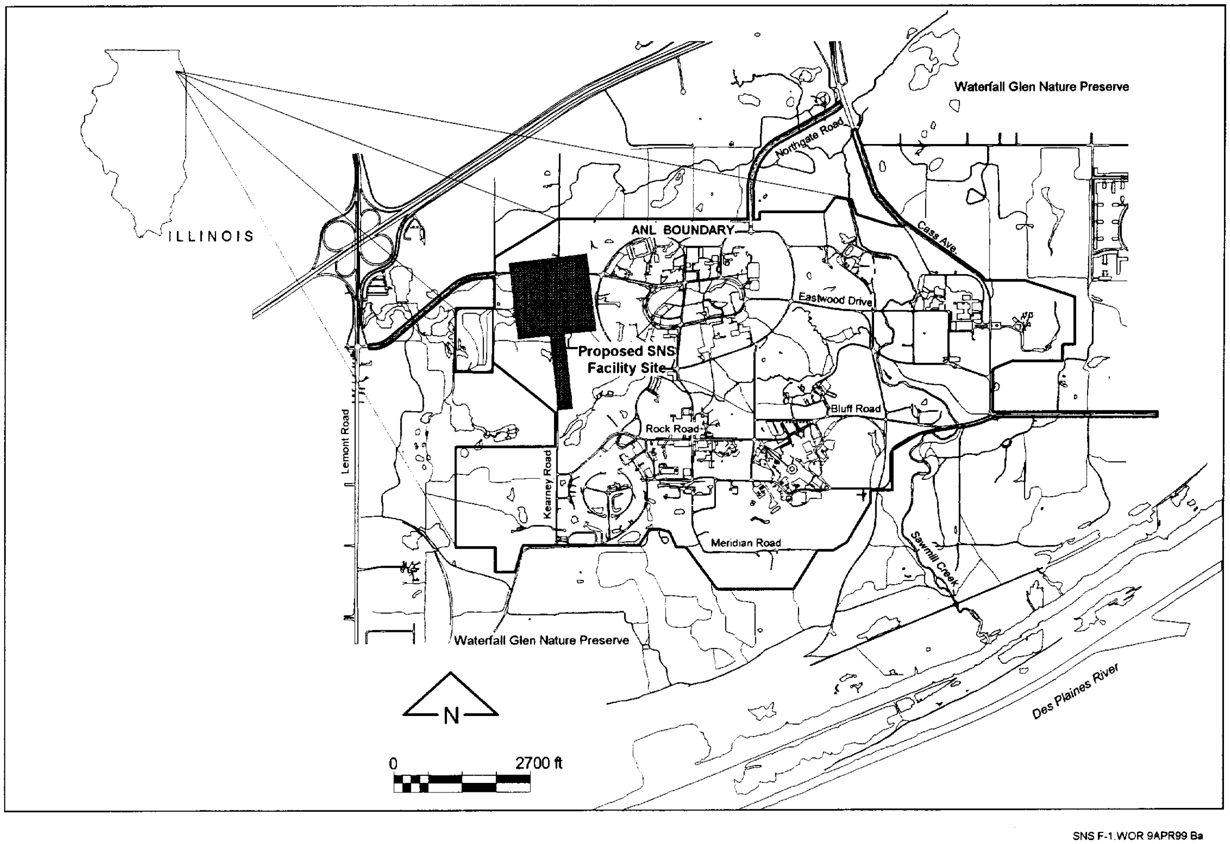

Figure S 1.3.3-1. Proposed SNS site at ANL.

the south. Within ANL, Sawmill Creek flows to the south through the eastern edge of the reservation and discharges into the Des Plaines River channel. Two intermittent branches of Freund Brook flow from west to east, draining the interior portion of the reservation and ultimately flowing into Sawmill Creek.

Floodplains: The footprint of the proposed SNS would overlie two small floodplain areas. The eastern edge of the SNS footprint would overlie a portion of the 100-year floodplain of an unnamed tributary of Sawmill Creek. The total area of this floodplain within the footprint would be approximately 5 acres (2 ha). In addition, the southern tip of the SNS footprint would overlie a portion of the 100-year floodplain of an unnamed tributary to Freund Brook. The area of this floodplain within the footprint would be <1 acre (0.40 ha).

Wetlands: A variety of wetland types occur in and around the proposed SNS site. About 3.4 acres (1.4 ha) of these wetlands occur within the site footprint. Most of these wetlands have been disturbed to some degree in the past. However, they continue to retain wetlands value such as wildlife habitat and flood control.

Groundwater: Groundwater in the area surrounding the proposed SNS site is segmented into three layered hydrogeological groups. Beginning at the ground surface, these layers are: glacial deposits of Pleistocene Age, shallow bedrock of Silurian Age, and deeper bedrock aquifers of Ordovician Age. Groundwater from the Silurian and Ordovician aquifers has been used for the ANL drinking water supply until recently. Since 1997, the laboratory's water resources have been obtained from Lake Michigan. This shift in potable water sources occurred as part of a widespread water distribution service change in the suburban areas near ANL. It was not related to actual or perceived pollution of groundwater by DOE operations at the laboratory.

S 1.3.4 BNL ALTERNATIVE

The proposed SNS site is located in the north-central portion of BNL. BNL is located in Suffolk County on Long Island, New York, in a section of the oak-chestnut forest region of the Atlantic Coastal Plain physiographic province. It shares many of the same coastal features common to the barrier islands of Massachusetts, New Jersey, and coastal regions as far south as Cape Hatteras, North Carolina. The location of the proposed SNS site at BNL is shown in Figure S 1.3.4-1.

Land Cover: The southern portion of the proposed SNS site consists of a stand of white pine, apparently planted during the 1930s under a Civilian Conservation Corps project. Communities composed of planted white pine are common in Suffolk County. Self-sown pitch pine is scattered within this area. The understory vegetation consists of huckleberry with lesser amounts of blueberry, but it is sparse due to shade and pine needle litter. Occasional oaks are found along the edges of the firebreaks and lanes in this area.

Protected Species: The northwest portion of the proposed SNS site approaches wetlands associated with the Peconic River. This area may be suitable habitat for the tiger salamander and the spotted salamander. Both are listed as special concern species by the state of New York. Thirteen species of plants found at BNL are officially listed as "protected plants" by the state of New York. Three of these species—spotted wintergreen, bayberry, and swamp azalea—have been found on the proposed SNS site.

Cultural Resources: No prehistoric archaeological sites have been identified on or adjacent to the proposed SNS site at BNL. However, four historic earthen features (Stations 2, 4, 8, and 10), which may have been used for trench warfare training at Camp Upton during World War I, were identified on the proposed SNS site. Camp Upton is a former U.S. Army facility that previously occupied BNL land.

These features are potentially eligible for listing on the NRHP. No TCPs are known to occur on or adjacent to the proposed SNS site. Because the SNS design team has not decided areas where construction or improvement of utility corridors, roads, and ancillary structures would be necessary to support the SNS, these areas have not been surveyed for cultural resources. The design team would establish these areas to avoid known cultural resources, and the areas would be surveyed prior to the beginning of SNS construction activities.

Land Use: The current land use category on the proposed SNS site is Open Space. The entire site is largely undeveloped land.

Surface Water: The Peconic River flows through the northern portion of BNL. It was designated as a Wild and Scenic River by the state of New York in 1986 because it represented the last significant undeveloped river within the Long Island Pine Barrens area. The northeast corner of the proposed SNS site is

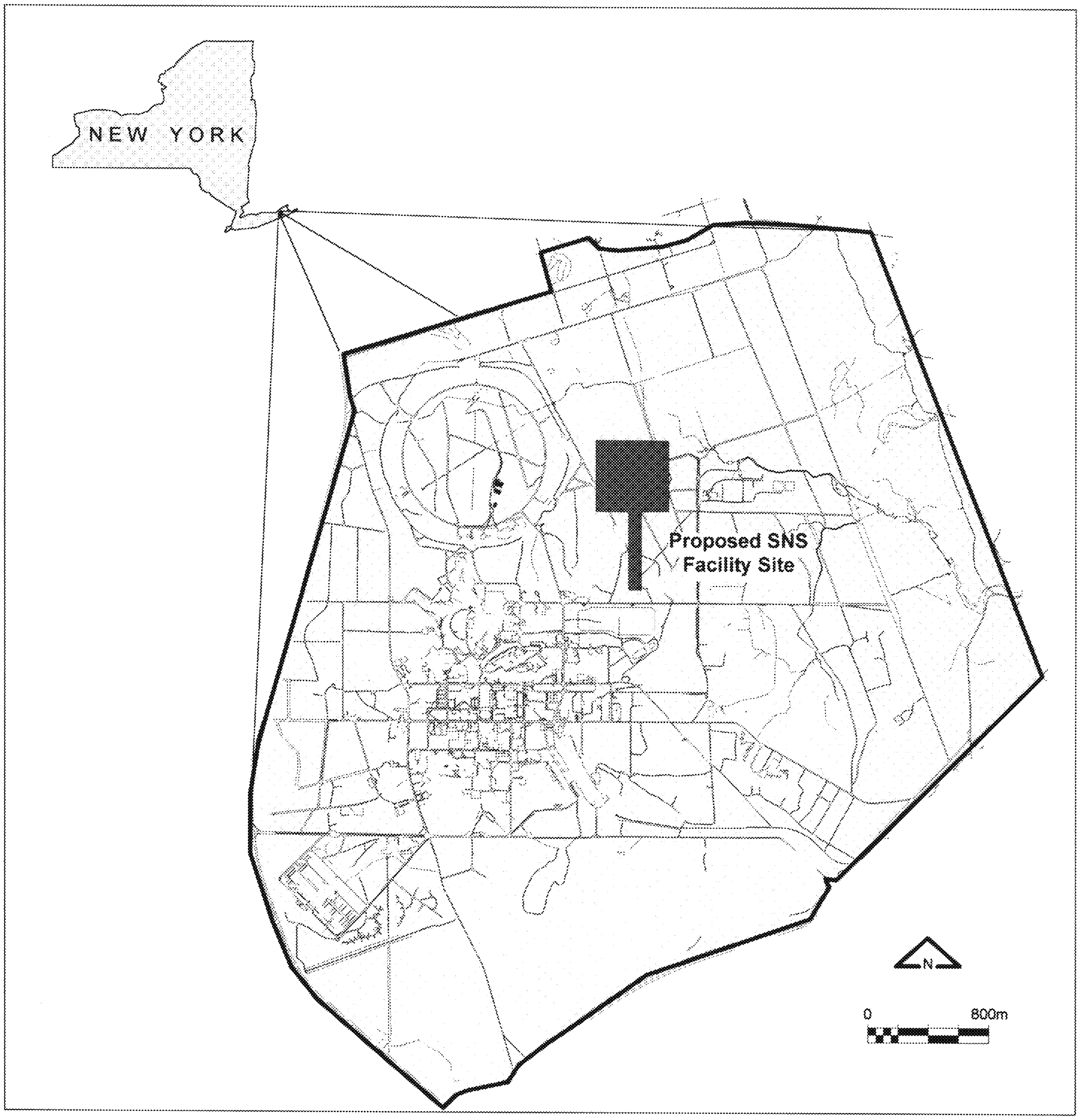

Figure S 1.3.4-1. Proposed SNS site at BNL.

approximately 300 ft (91 m) from the river. The headwaters of the Peconic River are located approximately 0.75 miles (1.2 km) to the west of BNL and exit the laboratory to the east.

Wetlands: Three wetlands are located in the vicinity of the proposed SNS site at BNL. These wetlands are associated with the upper reaches of the Peconic River. The Peconic River is protected under the New York Freshwater Wetlands Program and is classified as a Class I wetland.

Groundwater: BNL, and the proposed SNS site, are underlain by the Upper Glacial aquifer, Magothy aquifer, and Lloyd aquifer. The drinking water supply for Long Island comes from the Upper Glacial aquifer, a sole source aquifer characterized by high hydraulic conductivity. BNL overlies a deep-flow, groundwater-recharge zone for Long Island. Horizontal groundwater flow at BNL and the proposed SNS site are generally to the south and southeast.

S 1.4 ISSUES OF PUBLIC CONCERN AND AREAS OF CONTROVERSY

The draft environmental impact statement (DEIS) for the SNS was completed and made available for public review in December 1998. The Notice of Availability (NOA) to the public was published in the *Federal Register* on December 24, 1998, and this initiated a 45-day public review and comment period that ended on February 8, 1999. During this period, DOE held public hearings on the DEIS in the vicinity of each site for the proposed SNS. Hearings were held at the following locations on these dates: Los Alamos, New Mexico (January 19, 1999), Upton, New York (January 21, 1999), Argonne, Illinois (January 25, 1999), and Oak Ridge, Tennessee (January 28, 1999). At each hearing, attendees were given an opportunity to submit oral or written comments to DOE.

Throughout the review and comment period on the DEIS, reviewers were given the option of submitting comments to DOE by U.S. mail or courier service, toll-free telephone, facsimile, or electronic mail. To accommodate as many commenters as possible, comments were accepted after closure of the formal review and comment period. DOE considered such comments to the extent practicable. The last comment was received on April 6, 1999.

DOE received 206 public review comments on the DEIS. These comments and the formal DOE responses to them have been included in Appendix A of the FEIS. The texts of these comments were collectively analyzed to identify principal issues of concern to the public. As a result of this analysis, four major issues were identified. These issues are radioactive contamination of groundwater, selection of the proposed SNS site on the ORR, effects of the preferred alternative research projects in the Walker Branch Watershed, and the need for a Mitigation Action Plan (MAP). The analysis of potential environmental consequences resulting from the preferred alternative considers these issues in the FEIS. The analytical findings pertinent to the first two issues are summarized under the Impacts on Water Resources and Impacts on Land Use headings in the table at the end of Section S 1.7.2 of this Summary.

Each of the following sections in this Summary is devoted to one of the four principal issues of public concern.

S 1.4.1 RADIOACTIVE CONTAMINATION OF GROUNDWATER

Operation of the proposed SNS has the potential for neutron activation of soils in the shielding berm surrounding the linear accelerator and accumulator rings. This would result in the contamination of berm soils by radionuclides. A principal issue of concern to stakeholders is the potential for water infiltrating the berm soils to transport radionuclide contamination to saturated groundwater zones, especially those that are sources of potable water.

The key design element for shielding the linear accelerator and accumulator rings in the proposed SNS is an earthen berm. This berm would be designed to isolate the activation products generated by the SNS particle beam and to provide radiation protection for outside areas around the beam and ring tunnels. The berm would be constructed of compacted native soils and would be engineered to isolate activation products by minimizing the amount of water infiltrating the berm. The design incorporates a groundwater interceptor system to collect any water that might get through the engineered berm. This water would be sampled and analyzed for radionuclides. If any are found to be present, the water would be managed as low-level radioactive waste. Otherwise, the water would be released to the retention basin.

The FEIS analysis of radionuclide transport in berm soil is based on very conservative assumptions concerning dilution, groundwater travel times, and levels of radionuclides in the berm. Such conservatism was necessitated by uncertainties in the amounts of soil activation products in the berms and uncertainties about the groundwater at each of the proposed SNS sites. The results of this analysis present a bounding estimate of potential effects from the proposed action. This bounding estimate becomes the maximum design limit of the proposed SNS. If the need for additional groundwater protection is identified during design of the facility, an alternative berm design that would provide equal or better protection than is presented in the FEIS.

S 1.4.2 SELECTION OF THE PROPOSED SNS SITE ON THE OAK RIDGE RESERVATION

The DOE-Oak Ridge Operations Office has actively sought public input on the future use of ORR land. An Oak Ridge citizens advisory organization, the End Use Working Group, has recommended a set of final land use guidelines to DOE-ORO. One of these guidelines recommends the siting of additional DOE facilities on brownfield sites instead of greenfield sites. Brownfield sites are previously contaminated and/or developed areas, whereas greenfield sites are natural, undeveloped areas. The proposed SNS site at ORNL is a 110-acre (45-ha) tract of undeveloped forest land near the top of Chestnut Ridge. Selection of this greenfield site instead of a brownfield site for the proposed SNS is an issue of concern among stakeholders in the Oak Ridge area.

The proposed SNS site at ORNL was chosen through a formal site-selection process. This process is described in a document entitled Spallation Neutron Source, Oak Ridge National Laboratory Site Selection Report. The entire text of this report is included in Appendix B of the FEIS.

The process of selecting the preferred site for construction of the SNS on the Oak Ridge Reservation was a two-phase process. In the first phase, the entire reservation was screened to eliminate areas that were not suitable for construction of the SNS. Brownfield and greenfield areas of the reservation were both included. One of the screening criteria was identification of areas of land within the ORR with waste area groupings, environmental restoration projects, or waste management areas. These areas were eliminated from consideration because they would require cleanup, with some attendant uncertainty on the extent of cleanup required, prior to excavation for the SNS foundations. This activity could increase worker exposure to radioactive and nonradioactive contaminants, and would require the disposal of material removed during cleanup in a licensed landfill. This could affect both the budget and schedule of the project. Working in a contaminated area could increase labor costs and disposal costs of the contaminated materials. Coordinating with the Environmental Management program for the cleanup of these areas may resolve the budget issue; however, long schedule delays may result. Coordination of this construction effort with the requirement of RCRA or CERCLA for cleanup of these areas could add a year or more to the construction schedule of the SNS. Siting the SNS in a waste management area could require cleanup of the area with its associated cost increases and schedule delays, and possibly the relocation of waste management activities. The result of this first phase was the identification of four candidate sites; however, none of these were brownfield sites.

The second phase consisted of a comparative evaluation of the candidate sites using specific site evaluation criteria. One of the functional criteria was the avoidance of contaminated soils. One of the health and safety criteria was avoiding existing hazardous materials areas and waste areas (i.e., Waste Area Groups and RCRA sites). Again, these criteria were included to avoid the increased risk to construction workers and the increased costs and schedule delays associated with placing a large-scale construction project at a site with contaminated soils or hazardous materials.

S 1.4.3 EFFECTS ON RESEARCH PROJECTS IN THE WALKER BRANCH WATERSHED

The Walker Branch Watershed is an important research area located approximately 0.75 mi (1.2 km) east of the proposed SNS site at ORNL. It is one of the few sites in the world characterized by long-term, intensive environmental studies. Environmental monitoring and ecological research projects in the area are being conducted by the National Oceanic and Atmospheric Administration/ Atmospheric Turbulence and Diffusion Division (NOAA/ATDD) and the ORNL Environmental Sciences Division (ESD). The proposed SNS site is located within a buffer zone designed to protect research in the watershed. During construction and operation of the proposed SNS, CO_2 emissions from vehicles and small sources may adversely affect this research. During SNS operations, CO_2 emissions from natural gas boilers would affect such research. Operational emissions of water vapor from the SNS cooling towers may also affect this research. The principal effects would be loss of data quality and comparability of data over time. These potential effects on research in the Walker Branch Watershed are a principal issue of concern to stakeholders in the Oak Ridge area.

If the site at ORNL is selected for the SNS in the ROD, DOE would investigate appropriate measures to mitigate the potential effects of the proposed action on environmental monitoring and ecological research in the Walker Branch Watershed. Two measures that will be evaluated for mitigation of the effects from CO_2 emissions would be the use of heat pumps or heat recovery from the cooling towers instead of natural gas boilers to heat the SNS. The use of electric or ultra-low-emission vehicles to shuttle workers from remote parking lots to the SNS would also be evaluated. Another mitigation measure for the effects of CO_2 and water vapor emissions could be moving the existing NOAA/ATDD meteorological monitoring tower to a new location less susceptible to emissions from SNS activities or building a new monitoring tower at this new location. The evaluation and selection of appropriate mitigation measures will be documented in a MAP.

S 1.4.4. MITIGATION ACTION PLAN

Several commenters expressed concern about mitigation measures to minimize potential impacts of the SNS on research activities in the Walker Branch Watershed on the Oak Ridge

Reservation. One commenter suggested specific mitigation measures (see Section S 1.4.3).

If the decision in the ROD is to construct the SNS, DOE would prepare a MAP for the selected site. The MAP would present details concerning the planning, implementation, and monitoring of the mitigation measures designed to minimize potential impacts associated with construction and operation of the SNS. DOE would complete the MAP prior to the start of construction, and the document would be made available to the public for review and comment.

S 1.5 DEIS REVISIONS REFLECTED IN THE FEIS

DOE prepared formal written responses to all 206 of the public review comments on the DEIS (refer to Appendix A). In addition, DOE responded to many of these comments by revising the text of the DEIS to produce the FEIS. Many of these revisions involved minor corrections of information or data and the clarification of statements in the text.

Several major revisions involved the addition of new information, data, and analyses to the text. Such revisions were prompted by public review comments on the DEIS, agency compliance with applicable environmental protection requirements, and decisions to improve the quality of the document for the FEIS. The following major revisions are reflected in the text of the FEIS:

- Inclusion of a Floodplain/Wetlands Assessment to evaluate the potential effects of the proposed action on wetlands in the vicinity of the proposed SNS site at ORNL and floodplains/wetlands on the proposed SNS site at ANL. This document was prepared in accordance with the DOE regulations in 10 CFR 1022.12 to comply with the federal floodplain and wetlands protection requirements in Executive Order 11988, *Floodplain Management*, and Executive Order 11990, *Protection of Wetlands*, both dated May 24, 1977. The results of this assessment were used to extensively revise sections of the DEIS that address floodplains, wetlands, and the potential effects of the proposed action and alternatives on them. The Floodplain/Wetlands Assessment is in Volume II, Appendix H, of the FEIS.

- A reanalysis of the potential effects of the proposed action on visual resources at ANL. This analysis indicated that the potential effects would be minimal because existing views from points near the ANL fence in the Waterfall Glen Nature Preserve and on ANL land already contain buildings and other features indicative of development.

- If the ROD selects implementation of the proposed action, DOE will prepare a Mitigation Action Plan (MAP) to address the mitigation of environmental effects from the proposed action. This plan will be specific to the effects of the proposed action on the environment in the vicinity of the siting alternative selected in the ROD. The MAP will identify, evaluate, and commit DOE to the implementation of appropriate measures to mitigate these effects.

S 1.6 ISSUES TO BE RESOLVED

The identification and implementation of appropriate mitigation measures for the effects of the proposed action on the environment are dependent upon selection of the proposed action and a siting alternative for the proposed SNS. The DOE decision on whether or not to construct and operate the proposed SNS and selection of a siting alternative for this proposed action will be resolved and documented in the ROD. DOE will issue the ROD at least 30 days following the Environmental Protection Agency's Notice of Availability of the FEIS. The identification, evaluation, and commitment to mitigation measures will be resolved after publication of the ROD and prior to construction on the proposed SNS. As indicated in Sections S 1.4.4 and S 1.5, this process for selecting appropriate mitigation measures will be documented in a MAP.

S 1.7 ENVIRONMENTAL CONSEQUENCES

Environmental consequences are the potential effects that the proposed action would have on various aspects of the existing environment on and in the vicinity of the proposed SNS sites at ORNL, LANL, ANL, and BNL. They also include the effects that the no-action alternative would have on the existing environment. The aspects of the existing environment that could be affected are geology and soils, water resources (surface water and groundwater), air quality, noise, ecological resources, socioeconomics, cultural resources, land use, human health, infrastructure (transportation and utilities), and waste management.

S 1.7.1 SUMMARY OF ENVIRONMENTAL IMPACTS FROM THE ALTERNATIVES

This section provides a summary of the important environmental effects that would result from implementing the proposed action at each of the four SNS siting alternatives and from implementing the no-action alternative. These effects are described in terms of the various aspects of the existing environment that might be expected to change over time as a result of their implementation. This summary is based on the detailed environmental effects identified and described in Chapter 5 of this FEIS.

DOE will implement mitigation measures to minimize the impacts caused by the siting construction and operation of the SNS. DOE will prepare a MAP that will address mitigation commitments expressed in the ROD. The MAP will explain how the mitigation measures, designed to mitigate adverse environmental impacts associated with the SNS, will be planned and implemented. DOE will complete the MAP before taking any action directed by the ROD that is subject to a mitigation commitment. DOE will make copies of the MAP available to the public in accordance with 40 CFR 1506.6.

These environmental impacts, along with the other potential environmental effects identified during the assessment of environmental consequences, are also presented in a tabular format in Section S 1.7.2. This comparative format shows how particular aspects of the existing environment would be affected by all of the evaluated alternatives.

S 1.7.1.1 ORNL Alternative

During operation of the SNS, leaching of neutron-activated soil in the shielding berm for the linac tunnel could result in localized contamination of groundwater with radionuclides. As a result of limited migration and rapid decay of unstable radionuclides, an exceedance of drinking water limits for a human receptor would be highly unlikely.

Construction of the SNS would result in the partial encroachment of one small wetland [2.7 acres (1.1 ha)], probable encroachment and subsequent destruction of two small wetland areas [0.12 acres (0.05 ha)], and increased runoff and siltation to another wetland [1.6 acres (0.65 ha)]. DOE will implement mitigation measures to minimize impacts on wetlands.

A number of beneficial socioeconomic effects would result from construction and operation of the proposed SNS. Design and construction employment on the proposed SNS would peak in fiscal year (FY) 2002 during construction of the 1-MW facility. Based on the results of economic modeling, an estimated 1,499 direct, indirect, and induced jobs would be created, and the unemployment rate may potentially decrease from 3.2 to 3.0 percent. Operation of the proposed SNS at the 4-MW power level would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. The 4-MW operations would result in a maximum of 1,704 direct, indirect, and induced jobs. Approximately $68.7 million in local wages, $7.5 million in business taxes, and $75.9 million in personal income would result from these operations. The rate of unemployment may potentially decrease from 3.2 to 3.0 percent. The beneficial effects from operations at 1 MW would be similar to but slightly less than those from operations at 4 MW.

The NOAA/ATDD is conducting the TDFCMP in the Walker Branch Watershed (refer to Section S 1.4). In addition, the ORNL-ESD is conducting ecological research projects in this area. The TDFCMP is monitoring the continuous exchange of CO_2, H_2O vapor, and energy between the deciduous forest in this area and the atmosphere. During construction of the proposed SNS, emissions of CO_2 from construction vehicles could affect the TDFCMP and one long-term ORNL ecological research project in the watershed. The potential effects on research would be loss of CO_2 monitoring data quality and the comparability of data over time. During SNS operations, stack emissions of CO_2 from natural gas-fired boilers in the SNS heating system would similarly affect the TDFCMP and one ORNL ecological research project. Continued future emissions of CO_2 from the SNS stacks would result in such effects on the TDFCMP and could affect two ORNL research projects. During operations, emissions of H_2O vapor from the SNS cooling towers may affect the TDFCMP and two ORNL research projects with a loss of data quality and comparability over time. Continued future operation of the SNS could result in H_2O vapor effects on the TDFCMP and eight ORNL research projects. Continued operations may also affect strategic ORNL ecological research initiatives. Once again, the effects would be loss of data quality and comparability over time. DOE is considering the mitigation of effects on the TDFCMP by moving the current NOAA/ATDD monitoring tower to a different location or constructing a new tower at this different location. The installation of electric heat pumps instead of natural gas boilers is being considered to eliminate most operational CO_2 emissions from the proposed SNS.

The general public living in the vicinity of the ORR would be exposed to low levels of airborne radioactive emissions from operation of the proposed SNS. For operation at the 1-MW power level, the maximally exposed individual (MEI) would receive an annual radiation dose of 0.40 mrem, or 4 percent of the 10-mrem limit (40 CFR 61). For operation at the 4-MW power level, the MEI would receive an annual dose of

The maximally exposed individual is a hypothetical member of the public assumed to live at the boundary of the DOE-owned land for 8,760 hours per year and to produce their entire food supply at this location. For the ORNL alternative, this is the boundary of the Oak Ridge Reservation. For the LANL, ANL, and BNL alternatives, this is the boundary of the laboratory.

The off-site population consists of all individuals residing outside the ORR boundary within 50 miles(80 km) of the site and is assumed to be present for 8,760 hr/yr.

1.5 mrem, or 15 percent of the limit. The results of the mathematical model used to estimate the effects to the population surrounding ORNL show that operating the proposed SNS at the 1-MW power level for 10 years and the 4-MW power level for 30 years would cause 0.2 latent cancer fatalities in the general population.

S 1.7.1.2 LANL Alternative

The proposed SNS could affect the groundwater at LANL. Sustained pumping of groundwater from the main aquifer (functionally a sole source aquifer) to serve SNS operations could eventually lower the water levels in nearby wells and adversely affect productivity of the aquifer. Considering the projected 40-year lifecycle of the proposed SNS, sustained pumping over this many years added to possible increases in water demand by LANL and the local population could have a cumulative impact on aquifer productivity. Additionally, during operation of the SNS, leaching of neutron-activated soil in the shielding berm for the linac tunnel could result in localized contamination of groundwater. As a result of a low infiltration rate and great depth to groundwater [820 ft (250 m)], migrating radionuclides would decay to low concentrations before reaching the groundwater. Therefore, compared to the other siting alternatives, it is least likely that human receptors in the vicinity of LANL would be affected by contaminated groundwater in excess of safe drinking water limits.

A number of beneficial socioeconomic effects would result from construction and operation of the proposed SNS. Design and construction employment on the proposed SNS would peak in FY 2002 during construction of the 1-MW facility. Based on the results of economic modeling, an estimated 1,447 direct, indirect, and induced jobs would be created, and the unemployment rate may potentially decrease from 6.6 to 5.8 percent. Operation of the proposed SNS at the 4-MW power level would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. The 4-MW operations would result in a maximum of 1,486 direct, indirect, and induced jobs. Approximately $66.8 million in local wages, $7.6 million in business taxes, and $71.4 million in personal income would result from these operations. The rate of unemployment may potentially decrease from 6.6 to 5.8 percent. The beneficial effects from operations at 1 MW would be similar to but slightly less than those from operations at 4 MW.

Sixty-five percent of the proposed SNS site and an adjacent buffer zone have been surveyed for cultural resources. Five prehistoric archaeological sites eligible for listing on the NRHP have been identified within this area. During construction of the proposed SNS, all five sites would be destroyed by site preparation activities. If any more eligible sites are located within the 35 percent that has not been surveyed, they would also be destroyed by site preparation activities. If this site were chosen for construction of the proposed SNS, the remaining 35 percent would be surveyed and assessed for specific effects prior to the initiation of construction activities. These effects on prehistoric resources would be mitigated by data recovery.

No historic resources have been identified within the 65 percent survey area on and adjacent to the proposed SNS site. However, any NRHP-eligible historic sites, structures, or features that might occur within the 35 percent that has not been surveyed would be destroyed by site preparation activities. These effects on historic resources would be mitigated by data recovery.

During construction of the proposed SNS, site preparation activities would destroy five TCPs, all prehistoric archaeological sites. These sites are located within the 65 percent cultural resource survey area on and adjacent to the proposed SNS site. If any prehistoric archaeological sites are located within the 35 percent that has not been surveyed, these TCPs would also be destroyed. With respect to cumulative impacts on TCPs, the proposed action and expansion of the Low-Level Waste Disposal Facility into Zones 4 and 6 in TA-54 would destroy a total of 20 prehistoric archaeological sites. Because some American Indian tribal groups consider water resources to be TCPs, the previously described radionuclide contamination of groundwater and the reduction in aquifer productivity would also be important effects on TCPs. Because the specific identities and locations of other on-site TCPs are not known, potential effects on such specific resources are uncertain. If the LANL Alternative is selected by DOE, the remaining 35 percent of the proposed SNS site would be surveyed and assessed for cultural resources effects prior to the initiation of construction activities. Similarly, additional consultations on the locations of site-specific TCPs would be held with Hispanic and tribal groups.

Construction and operation of the proposed SNS would have effects on land use with respect to recreational and visual resources. The public use of TA-70 hiking trails near the proposed SNS site may end or be restricted during construction of the SNS and throughout its operational life cycle. Landscape views in the vicinity of the proposed SNS site would be changed from natural piñon-juniper woodlands to industrial development. The SNS facilities would be visible from points on the proposed SNS site, State Route 4, the access road to the proposed SNS site, and hiking trails in TA-70. Because other lighted facilities are not present in the immediate area, the SNS facilities would be highly visible at night. They would not be visible, however, from the nearby community of White Rock and popular public use areas in Bandelier National Monument.

The general public living in the vicinity of LANL would be exposed to low levels of airborne radioactive emissions from operation of the proposed SNS. For operation at the 1-MW power level, the MEI would receive an annual radiation dose of 0.47 mrem, or 4.7 percent of the 10-mrem limit. For operation at the 4-MW power level, the MEI would receive an annual dose of 1.8 mrem, or 18 percent of the limit. The results of the mathematical model used to estimate the effects to the population surrounding LANL show that operating the proposed SNS at the 1-MW power level for 10 years and the 4-MW power level for 30 years would cause 0.2 latent cancer fatalities in the general population.

Effects on utility infrastructure would result from implementing the proposed action on the SNS site at LANL. The electrical power system serving LANL is inadequate to supply the 62-MW and 90-MW power demands of the proposed SNS, and it is potentially unreliable because of its age. Supplying the SNS would require a new power line to the SNS site, new regional and multistate power grid configurations, and possibly a site-specific SNS power generation station. Because the distribution systems for other utilities do not extend to the site, a considerable investment would be necessary to build the required infrastructure. From a cumulative impacts perspective, the addition of SNS demands for power and water to future demands by LANL and the local population would exceed the capacity of existing distribution systems and require additional infrastructure.

S 1.7.1.3 ANL Alternative

The proposed action would have effects on floodplain areas that occur on the SNS site at ANL. The eastern edge of the proposed SNS footprint would encroach on the 100-year floodplain of an unnamed tributary of Sawmill Creek. In addition, the southern tip of the footprint would encroach on the 100-year floodplain of an unnamed tributary of Freund Brook. These floodplain locations would pose at least some risk of flooding during construction of the SNS. Filling and stabilization, drainage pattern alterations, man-made drainage features, and optomizing the placement of buildings and the retention basin to avoid floodplains would be implemented as part of SNS construction to minimize potential effects from flooding during SNS operations (refer to Volume II, Appendix H of the FEIS).

Operations at the proposed SNS could have effects on groundwater at ANL. The leaching of neutron-activated soil in the shielding berm for the linac tunnel may result in localized contamination of groundwater with radionuclides. A shallow aquifer not used as a source of potable water lies beneath the proposed SNS site at a depth of 65 ft (20 m). Aquifers that are sources of potable water occur at a depth of 165 ft (50 m). The geological formations overlying the potable aquifers would retard the downward migration of groundwater contaminated with radionuclides. For example, groundwater movement through the saturated zone of the Wadsworth Till, a complex mixture of silts, clays, and sand, is only about 3 ft/yr (0.9 m/yr). However, the accurate prediction of migration rates and the potential for aquifer contamination with radionuclides would be difficult because of the complexity of these deposits.

Construction on the proposed SNS and the now completed and operating Advanced Photon Source (APS) would have a cumulative impact on terrestrial wildlife at ANL. The total area of land cleared for these two projects would be approximately 160 acres (65 ha). Clearing 15 percent of the undeveloped land at ANL would decrease the terrestrial wildlife inhabiting ANL land. Population levels would be decreased by an amount generally proportional to the amount of habitat lost. Except for the fallow deer, the species that would be affected are typical of the surrounding region and are not particularly rare or important as game animals.

Construction of the proposed SNS would have an effect on some wetland areas at ANL. Approximately 3.5 acres (1.4 ha) of wetlands would be destroyed by construction activities. This is about 20 percent of the wetlands on and in the vicinity of the proposed SNS site and about 7 percent of the jurisdictional wetlands on ANL property. DOE would implement appropriate mitigation measures to minimize the impacts of this wetland loss, per the Record of Decision.

A number of beneficial socioeconomic effects would result from construction and operation of the proposed SNS. Design and construction employment on the proposed SNS would peak in FY 2002 during construction of the 1-MW facility. Based on the results of economic modeling, an estimated 1,795 direct, indirect, and induced jobs would be created. Because of the very large regional population, no decrease in the regional unemployment rate would be expected. Operation of the proposed SNS at the 4-MW power level would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. The 4-MW operations would result in a maximum of 1,776 direct, indirect, and induced jobs. Approximately $82.9 million in local wages, $8.7 million in business taxes, and $91.2 million in personal income would result from these operations. The rate of unemployment may potentially decrease from 5.2 to 5.1 percent. The beneficial effects from operations at 1 MW would be similar to but slightly less than those from operations at 4 MW.

A prehistoric archaeological site (11DU207) is located adjacent to the proposed SNS site. ANL has not assessed the NRHP eligibility of this site, which may be disturbed or destroyed by construction activities. If the proposed SNS site were chosen for construction of the SNS, an assessment of eligibility would be performed prior to the initiation of construction activities. If it is determined that 11DU207 is a prehistoric cultural resource, the effects would be mitigated by avoidance, if possible, or data recovery.

Cumulative impacts on undeveloped land would result from constructing the SNS and APS at ANL. The SNS and now operational APS would introduce development to approximately 160 acres (65 ha) of undeveloped ANL land. This would reduce the already limited area of undeveloped ANL land available for development by about 15 percent. The SNS and APS would reduce land in the current Open Space land use category by 145 acres (59 ha). This would reduce the already limited area of Open Space land available for development by about 15 percent.

The general public living in the vicinity of ANL would be exposed to low levels of airborne radioactive emissions from operation of the proposed SNS. For operation at the 1-MW power level, the MEI would receive an annual radiation dose of 3.2 mrem, or 32 percent of the 10-mrem limit. For operation at the 4-MW power level, the MEI would receive an annual dose of 12 mrem. This dose exceeds the 10-mrem limit. However, as presented in the ANL report, *Argonne National Laboratory—East Site Environmental Report for Calendar Year 1996*, the MEI at a location actually occupied by people from existing operations at ANL is very low, only 0.021 mrem. Since the dose of 12 mrem projected for SNS operations at 4 MW is based on a hypothetical individual much closer to the facility, ANL would remain in compliance with the addition of emissions from the proposed SNS facility. The results of the mathematical model used to estimate the effects to the population surrounding ANL show that operating the proposed SNS at the 1-MW power level for 10 years and the 4-MW power level for 30 years would cause 0.2 latent cancer fatalities in the general population.

Construction of the SNS would have effects on transportation at ANL. The main access to ANL from the west is via Westgate Road, and a portion of Westgate Road lies within the proposed SNS site. Construction of the SNS would eliminate the use of this segment of road as an access corridor to the laboratory as a whole. This would require infrastructure construction to reroute approximately 1 mile(1.6 km) of Westgate Road to the north around the SNS site.

S 1.7.1.4 BNL Alternative

The leaching of neutron-activated soil in the shielding berm for the linac tunnel may result in localized contamination of groundwater with radionuclides. The sole source aquifer that provides potable water to the large population of Long Island lies only 20 ft (6.1 m) below the land surface on the SNS site. In addition, the soils on the site are primarily composed of quartz sand. Because these soils have a high permeability that can approach 17 ft/yr (5.2 m/yr), they have little ability to retard the migration of contaminated groundwater. Thus, among the four siting alternatives for the proposed action, this alternative has the greatest potential for increasing radionuclide concentrations in an aquifer that produces potable water. At another BNL facility, the Advanced Gradient Synchrotron (AGS), only two radionuclides (^{3}H and ^{22}Na) have sufficient half-life duration to pose a contamination problem for groundwater. Calculated dilution of these radionuclides in groundwater reduces exposure estimates for off-site receptors to below levels of concern. If comparable dilution concentrations at levels of concern would not be transported to off-site receptors. With respect to cumulative impacts on groundwater at BNL, the Relativistic Heavy Ion Collider (RHIC) is located about 656 ft (200 m) west of the proposed SNS site. Because of their close proximity, the potential exists for the co-mingling of radionuclides from the SNS and RHIC in groundwater. Once again, these effects would apply primarily to groundwater beneath BNL, and effects on off-site receptors would be minimal.

A number of beneficial socioeconomic effects would result from construction and operation of the proposed SNS. Design and construction employment on the proposed SNS would peak in FY 2002 during construction of the 1-MW facility. Based on the results of economic modeling, an estimated 1,481 direct, indirect, and induced jobs would be created, and the unemployment rate may potentially decrease from 3.4 to 3.3 percent. Operation of the proposed SNS at the 4-MW power level would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. The 4-MW operations would result in a maximum of 1,551 direct, indirect, and induced jobs. Approximately $41.6 million in local wages, $10.3 million in business taxes, and $80.5 million in personal income would result from these operations. The rate of unemployment may potentially decrease from 3.4 to 3.2 percent. The beneficial effects from operations at 1 MW would be similar to but slightly less than those from operations at 4 MW.

A number of earthen features have been identified on the proposed SNS site at BNL. They are located at four cultural resources survey stations (Stations 2, 4, 8, and 10). These features, all potentially eligible for listing on the NRHP, may have been associated with World War I trench warfare training at Camp Upton, a U.S. military installation that previously occupied BNL land. These features would be destroyed by SNS construction activities such as site preparation. The effects would be mitigated by data recovery.

The general public living in the vicinity of BNL would be exposed to low levels of airborne radioactive emissions from operation of the proposed SNS. For operation at the 1-MW power level, the MEI would receive an annual radiation dose of 0.91 mrem, or 9 percent of the 10-mrem limit. For operation at the 4-MW power level, the MEI would receive an annual dose of 3.4 mrem, or 34 percent of the limit. The results of the mathematical model used to estimate the effects to the population surrounding BNL show that operating the proposed SNS at the 1-MW power level for 10 years and the 4-MW power level for 30 years would cause 0.2 latent cancer fatalities in the general population.

S 1.7.1.5 No-Action Alternative

None of the environmental effects from implementing the proposed action would occur under the no-action alternative because the proposed SNS would not be constructed at any of the four alternative sites or at any other site. For example, no undeveloped land would be used for development, no soils or groundwater would become radioactively contaminated, no wetland areas would be taken by construction activities, and no endangered or threatened species would be affected. No beneficial effects would be realized in the form of increased income and jobs.

DOE implementation of the no-action alternative would have no effects on existing, reactor-based neutron sources. None of the existing, reactor-based sources would be discontinued as a result of implementing the no-action alternative or the proposed action. This would be a result of the major technological differences between reactor-based neutron sources and accelerator-based sources such as the proposed SNS. Because of these basic differences, each technology is best suited to exploring different scientific opportunities.

Because of high and ever-increasing demand for access to neutron science facilities, existing U.S. facilities would increasingly fail to meet domestic experimentation demand under the no-action alternative. A longstanding lag in U.S. experimental capabilities behind those of foreign nations with more extensively upgraded neutron science facilities would continue to widen.

S 1.7.2 TABULAR SUMMARY OF ENVIRONMENTAL IMPACTS

Table S 1.7.2-1 contains a comprehensive summary of the potential environmental impacts that may result from the proposed action, as implemented through the four siting alternatives, and the no-action alternative. The table covers environmental impacts, which are presented according to internal headings that correspond to the major impacts analysis subheadings in Chapter 5 of this FEIS. Under the other internal headings, this table covers impacts on long-term productivity of the environment and cumulative impacts. Unless otherwise indicated, the impacts of a 4-MW facility are given. Where there are substantial differences in impacts, data are given for both 1 MW and 4 MW.

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Table S 1.7.2-1. Comparison of impacts among alternatives.

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
1a. Impacts on Geology and Soils (Construction)				
No effects from seismicity.				No effects from seismicity.
Erosion and siltation during construction. Minimal effects on soils or site stability.				No effects on soils or site stability.
No effects on prime or unique farmlands because none are present on or near any of the proposed SNS sites.				No effects on prime or unique farmlands.
1b. Impacts on Geology and Soils (Operations)				
The soil in the berm used to shield the linac tunnel would be subject to neutron activation caused by a small portion of particles (hydrogen ions) escaping from the particle beam as it travels down the linac. An estimated total of 3.09 E05 Ci of radioactive isotopes would be generated in the soil berm by neutron activation over the life of the facility. The maximum design beam loss rate is 1.0 E-09 amps per meter of linac. This design limit is the same for all linac beam power levels, hence soil activation would be the same at both 1 and 4 MW. For the analysis of potential effects, the beam loss is assumed to be 10.0 E-09. The total curies (3.09 E05) is based on this conservative limit.				No effects on soils.
No effects from seismicity or on site stability because of design to meet known seismic hazards at ORNL, LANL, ANL, or BNL.				No effects from seismicity.
No effects on prime or unique farmlands because none are present on or near any of the proposed SNS sites.				No effects on prime or unique farmlands.
2a. Impacts on Water Resources (Construction)				
No effects on floodplains. Minimal increase in run-off and siltation from improvements to Chestnut Ridge Road.	No effects on floodplains.	Construction in small areas on the 100-year floodplains of two unnamed tributaries of Sawmill Creek and Freund Brook. The areas of floodplain that would be affected are, respectively, 5 acres (2 ha) and <1 acre (0.40 ha).	No effects on floodplains.	No effects on floodplains.
Minimal effects on surface water (see Impact 1a).				No effects on surface water.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
2b. Impacts on Water Resources (Operations)				
No effects on floodplains.				No effects on floodplains.
Overall effects expected to be minimal. Discharges to surface water would increase average base flow, resulting in increased stream velocity and channel erosion in White Oak Creek. Minimal effects from biocides and antiscaling agents relative to flow. Slight increase in radionuclide flux over White Oak Dam.	Overall effects expected to be minimal. Discharges to surface water would result in channel erosion in intermittent TA-70 drainages. Most flow would infiltrate soil before reaching Rio Grande River. Minimal effects from biocides and antiscaling agents relative to flow.	Overall effects expected to be minimal. Discharges to surface water would increase base flow, resulting in increased stream velocity and channel erosion in an unnamed tributary of Sawmill Creek. Minimal effects from biocides and antiscaling agents relative to flow.	Overall effects expected to be minimal. Discharges to surface water would increase base flow, resulting in increased stream velocity and channel erosion in the headwaters of the Peconic River. Most flow would infiltrate the subsurface in the river channel before reaching the BNL boundary. Minimal effects from biocides and antiscaling agents relative to flow.	No effects on surface water resources.
Potential localized increase in groundwater radionuclide concentrations (at a depth of 100 ft or more) due to leaching of neutron-activated soil in the shielding berm for the linac tunnel. Three radionuclides would equal or exceed the 10 CFR Part 20 limit (shown in parentheses) at 10 m away from the site: ^{14}C 4.4 E-04 μCi/cc (3E-04 μCi/cc), ^{22}Na 5.5 E-05 μCi/cc (6 E-06 μCi/cc), and ^{54}Mn 3.0 E-05 μCi/cc (3 E-05 μCi/cc).	Pumping may lower water levels in nearby wells and affect productivity of main aquifer. Potential localized increase in groundwater radionuclide concentrations due to leaching of neutron-activated soil in the shielding berm for the linac tunnel. Groundwater effects would be least likely at LANL because of low infiltration rate and greater depth [820 ft (250 m)] to main aquifer.	Potential localized increase in groundwater radionuclide concentrations due to leaching of neutron-activated soil in the shielding berm for the linac tunnel. A potable groundwater aquifer lies at a depth of 165 ft (50 m). The downward rate of water movement through the saturated zone of the Wadsworth Till is only 3.0 ft/yr (0.9 m/yr). High clay content of the till would retard radionuclide migration, (continued on next page)	Highest potential for increase in groundwater radionuclide concentrations due to leaching of neutron-activated soil in the shielding berm for the linac tunnel. The sole source aquifer for Long Island would lie only 20 ft (6.1 m) below the SNS. High permeability of the soils [17 ft/yr (5.2 m/yr)] would allow higher levels of radionuclides in the aquifer in the immediate vicinity of the SNS. Exceedance of (continued on next page)	No effects on groundwater resources.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
2b. Impacts on Water Resources (Operations) — continued				
		but accurate prediction of migration rates and potential for aquifer contamination would be difficult because of the complex deposits.	drinking water limits for a human receptor at an off-site location would be unlikely.	
3a. Impacts on Climate and Nonradiological Air Quality (Construction)				
Temporary increases in suspended particulates (PM_{10}) during work hours (10-hr day). Primarily fugitive dust from vegetation clearing, excavation, and land contouring.				No effects on nonradiological air quality.
3b. Impacts on Climate and Nonradiological Air Quality (Operations)				
No effects on local or regional climate.				No effects on local or regional climate.
Combustion of natural gas would emit air pollutants, CO_2, CO, NO_2, and PM_{10}, limited by NAAQS. Off-site levels of pollutants would all be less than 20% of the NAAQS limit. Diesel back-up generators would only run in an emergency. Effects on nonradiological air quality would be expected to be minimal.	Combustion of natural gas would emit air pollutants, CO_2, CO, NO_2, and PM_{10}, limited by NAAQS. Off-site levels of pollutants would all be less than 5% of the NAAQS limit. Diesel back-up generators would run only in an emergency. Effects on nonradiological air quality would be expected to be minimal.			No effects on nonradiological air quality.
4a. Impacts on Noise Levels (Construction)				
Short-term increase in noise to continuous moderate levels (approximate average level of 86 dBA). Effects on humans and wildlife would be minimal because of distances (more than 400 ft) from sources, natural barriers, and worker hearing protection.				No effects on noise levels.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
4b. Impacts on Noise Levels (Operations)				
Elevated continuous noise levels from cooling towers, compressors, and ventilation fans/blowers (approximate average level of 86 dBA). Minimized with landscape barriers. Periodically increased traffic noise. Minimal overall noise effects to human and wildlife populations.				No effects on noise levels.
5a. Impacts on Ecological Resources (Construction)				
Removal of vegetation from 110 acres (45 ha) of land (less than 0.5% of the total forested area of the ORR) would result in increased forest fragmentation. This would have a minimal effect on terrestrial wildlife movement because a forested path along Chestnut Ridge would be retained. Only a portion of the ridge and ORR would be affected.	Removal of vegetation from 110 acres (45 ha) of land. Minimal effects on wildlife movement or the roosting, feeding, and reproduction of birds because 90% of TA-70 would remain undeveloped.	Removal of vegetation from 110 acres (45 ha) of land partially developed in the past. This would result in a long-term reduction of wildlife habitat and populations on the SNS site and in adjacent areas. These effects would be minimal because the species that would be involved are neither rare nor game species and other habitat exists in the region.	Removal of vegetation from 110 acres (45 ha) of land would displace wildlife to surrounding areas. The displacement of this wildlife may exceed the wildlife carrying capacity of the adjacent areas, resulting in a small but permanent population reduction for one or more species. The proposed site lies within the Compatible Growth Area of the Pine Barrens. The 110 acres represent less than 20% of the Pine Barrens Protection Area.	No effects on terrestrial resources.
Construction would temporarily disturb wildlife occupying areas adjacent to the proposed site. This could result in emigration of some sensitive species from the surrounding area.				No effects on terrestrial resources.
Construction of the SNS facility would not directly impact wetlands. The Chestnut Ridge Road upgrade would elimate 0.23 acres (0.09 ha) of wetland, which includes parts of three wetlands. Clearing and (continued on next page)	No effects on wetlands within the SNS site or in TA-70 because there are no wetlands on or in the vicinity of the proposed site.	Approximately 3.5 acres (1.4 ha) of wetlands would be destroyed by construction. DOE would consult with regulatory agencies on plans to mitigate their loss. Temporary, minor effects on other wetlands surrounding (continued on next page)	There are no wetlands within the proposed SNS site. Minimal effects on Peconic River wetlands from runoff and sedimentation because of implementing runoff and erosion control measures.	No effects on wetlands.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
5a. Impacts on Ecological Resources (Construction) — continued				
grading for a proposed detention pond has the potential to indirectly affect a nearby wetland. Indirect impacts may include increased runoff and siltation and long-term impacts such as altered hydrology and changes in the vegetation community. There would be minimal effects on four additional wetlands located outside of the construction area. Appropriate mitigation measures, including implementation of proper construction techniques to control erosion and surface runoff and wetland replacement or enhancement would be employed to minimize effects on these wetlands.		the proposed site may occur during construction. These indirect impacts would be avoided or minimized through the implementation of proper construction techniques to control erosion and surface runoff.		
Minimal effects on aquatic resources from increased runoff and sediment loading in White Oak Creek due to runoff and erosion control measures. Minimal effects on cool water fish (banded (continued on next page)	No effects on aquatic resources. There are no aquatic resources on or in the vicinity of the proposed site.	Minimal effects on aquatic resources, particularly bottom-dwelling fauna, from increased runoff and sediment loading in Freund Brook, because of establishing a 100- to 200-ft (continued on next page)	Minimal effects on aquatic resources from increased runoff and sediment loading in the Peconic River, because of establishing a minimum 300-ft (91-m) uncleared vegetation buffer zone (continued on next page)	No effects on aquatic resources.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
5a. Impacts on Ecological Resources (Construction) — continued				
sculpin and blacknose dace) habitat from vegetation clearing and associated solar radiation increase of water temperature in White Oak Creek, because of leaving a 100- to 200-ft (30- to 60-m) uncleared vegetation buffer zone along the creek for shade.		(30- to 60-m) uncleared vegetation buffer zone along the brook and implementing erosion control measures.	between the SNS site and the river and implementing erosion control measures.	
Potential effects on threatened and endangered (T&E) plant species would be minimal due to implementation of protective measures. No T&E or other protected animal species were identified within the proposed footprint of the SNS.	Potential effects on American peregrine falcon and bald eagle population from small reductions in non-nesting habitat would be minimal. No T&E plant species were identified on the SNS site.	No protected species were identified on the proposed SNS site. Therefore, no effects on T&E or other protected species.	Potential effects on state-protected plant species identified on the SNS site due to implementation of protective measures would be minimal. No T&E or other protected animal species were identified on the SNS site.	No effects on T&E or other protected species.
5b. Impacts on Ecological Resources (Operations)				
During operations, cooling water and runoff from the site would be directed to the retention basin and discharged into White Oak Creek downstream of Bethel Valley Road; thus, increased runoff and sedimentation in wetlands in the vicinity of the site is not expected to occur. Road runoff would be	Minimal effects on wetlands in arroyos of Ancho Canyon and unnamed canyon to the northeast because cooling water flow could not reach these areas, except possibly during a heavy rain event.	During operations, runoff from the site would be directed to the retention basin; thus, increased runoff to wetlands in the vicinity of the site would be expected to be minimal.		No effects on wetlands.

(continued on next page)

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
5b. Impacts on Ecological Resources (Operations) - (continued)				
<u>diverted to stormwater control structures, such as swales, to avoid the effects of increased runoff in wetlands.</u>				
Minimal effects on aquatic resources in the headwaters area of White Oak Creek. Cooling water and runoff from the proposed site would be collected in the retention basin. Discharge to White Oak Creek would be south of Bethel Valley Road. If necessary, the cooling tower blowdown would be dechlorinated. The retention basin would allow for reduction in the temperature of the water prior to discharge in White Oak Creek. Only minimal effects to aquatic resources downstream from the discharge point would be expected.	No effects on aquatic resources.	Biotic communities in Sawmill Creek may change as a result of increased flow from cooling water and runoff discharged into it from the retention basin. These effects on aquatic resources would be minimal because the temperature of the discharge would be reduced to ambient temperature in the retention basin.	No effects on aquatic resources in the upper reaches of the Peconic River because cooling water and runoff in the retention basin would be released to the river near the current Sewage Treatment Plant outfall. Downstream flow increase would be less than a routine rain event, resulting in minimal effects to aquatic resources. If necessary, the cooling tower blowdown would be dechlorinated. The retention basin could allow for reduction in the temperature of the water prior to discharge to the Peconic River. Only minimal effects to aquatic resources would be expected.	No effects on aquatic resources.
<u>May affect</u> T&E plant species. Protective measures would be implemented. No T&E or other protected animal species were (continued on next page)	No T&E plant species were identified on the proposed SNS site. <u>May affect the</u> American peregrine falcon and bald eagle populations (continued on next page)	No known T&E or other protected species at ANL would be affected.	<u>May affect</u> state-protected plant species. Protective measures would be implemented. No T&E or other protected animal (continued on next page)	No effects on T&E or other protected species.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
5b. Impacts on Ecological Resources (Operations) — continued				
identified on the proposed SNS site. Two plants protected by the State of Tennessee, pink lady's slipper and American ginseng, were found in areas adjacent to the proposed site.	because their use of the SNS site area would be less likely after development.		species were identified on the proposed SNS site.	
6a. Impacts on Socioeconomics (Construction)				
Peak construction workforce of 578 workers would occur during construction of the 1-MW facility. Approximately 25% of workers may come from outside the Region of Influence (ROI). Based on experience with past major construction projects, most in-migrating workers would not relocate their families. However, if all in-migrating workers brought families into the area, the regional population would increase by approximately 0.01–0.02%. This would have minor effects on housing and regional community services.				No effects on regional population growth.
Design and construction employment would peak in FY 2002 during construction of the 1-MW facility. Based on modeling of regional economics, there would be an estimated 1,499 new jobs created, including direct, indirect, and induced jobs. Unemployment rate may potentially decrease from 3.2 to 3.0%.	Design and construction employment would peak in FY 2002 during construction of the 1-MW facility. Based on modeling of regional economics, there would be an estimated 1,447 new jobs created, including direct, indirect, and induced jobs. Unemployment rate may potentially decrease from 6.6 to 5.8%.	Design and construction employment would peak in FY 2002 during construction of the 1-MW facility. Based on modeling of regional economics, there would be an estimated 1,795 new jobs created, including direct, indirect, and induced jobs Because of the very large regional population, no decrease in the regional unemployment rate would be expected.	Design and construction employment would peak in FY 2002 during construction of the 1-MW facility. Based on modeling of regional economics, there would be an estimated 1,481 new jobs created, including direct, indirect, and induced jobs. Unemployment rate may potentially decrease from 3.4 to 3.3%.	No economic benefit.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
6b. Impacts on Socioeconomics (Operations)				
Workforce for operation of the proposed SNS would be 250 persons for the 1-MW facility and 375 for the 4-MW facility. Regional population growth of approximately 0.01–0.03% due to worker in-migration would have minor effects on housing and regional community services.				No effects on regional socioeconomics.
Operation of the proposed SNS at 4 MW would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. Operation of the proposed SNS would result in a maximum of 1,704 direct, indirect, and induced jobs. Operations would result in approximately $68.7 million in local wages, $7.5 million in business taxes, and $75.9 million in personal income. Unemployment rate may potentially decrease from 3.2 to 3.0%.	Operation of the proposed SNS at 4 MW would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. Operation of the proposed SNS would result in a maximum of 1,486 direct, indirect, and induced jobs. Operations would result in approximately $66.8 million in local wages, $7.6 million in business taxes, and $71.4 million in personal income. Unemployment rate may potentially decrease from 6.6 to 5.8%.	Operation of the proposed SNS at 4 MW would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. Operation of the proposed SNS would result in a maximum of 1,776 direct, indirect, and induced jobs. Operations would result in approximately $82.9 million in local wages, $8.7 million in business taxes, and $91.2 million in personal income. Unemployment rate may potentially decrease from 5.2 to 5.1%.	Operation of the proposed SNS at 4 MW would result in substantial regional spending for operator salaries, supplies, utilities, and administrative support. Operation of the proposed SNS would result in a maximum of 1,551 direct, indirect, and induced jobs. Operations would result in approximately $71.6 million in local wages, $10.3 million in business taxes, and $80.5 million in personal income. Unemployment rate may potentially decrease from 3.4 to 3.2%.	No economic benefits.
The effects of operation of the proposed SNS at the 1-MW power level would be similar but slightly less than the 4-MW case.				

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
6b. Impacts on Socioeconomics (Operations) — continued				
Operation of the proposed SNS would not cause high and/or adverse impacts to any of the surrounding populations. Therefore, there would not be a disproportionate risk of significantly high and adverse impact to minority and low-income populations.				The No-Action alternative would not cause high and/or adverse impacts to any of the surrounding populations. Therefore, there would not be a disproportionate risk of significantly high and adverse impact to minority and low-income populations.
7a. Impacts on Cultural Resources (Construction)				
No effects on prehistoric resources. No prehistoric cultural resources have been identified on or in the vicinity of the proposed SNS site.	Five prehistoric archaeological sites within the 65% survey area at the SNS site and eligible for listing on the NRHP would be destroyed by site preparation activities. In the unsurveyed area of the proposed SNS site, any prehistoric sites listed on or eligible for listing on the NRHP could also be destroyed by site preparation. If this site were chosen for construction of the SNS, the remaining 35% would be surveyed and assessed for specific effects prior to the initiation of construction activities. Effects on (continued on next page)	Prehistoric site 11DU207, adjacent to the proposed SNS site, may be disturbed or destroyed by construction activities. ANL has not assessed the NRHP eligibility of site 11DU207. If this site were chosen for construction of the SNS, an assessment of eligibility would be performed prior to the initiation of construction activities. If it is determined that a cultural resource would be affected, the effects would be mitigated by avoidance, if possible, or data recovery.	No effects on prehistoric resources. No prehistoric No effects on prehistoric resources. No prehistoric cultural resources have been identified on or in the vicinity of the proposed SNS site.	No effects on prehistoric resources.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
7a. Impacts on Cultural Resources (Construction) — continued				
	prehistoric archaeological sites would be mitigated by data recovery.			
No effects on historic resources. No historic cultural resources have been identified on or in the vicinity of the proposed SNS site.	No effects on historic resources within the surveyed 65% of the SNS site and buffer zone because no such resources have been identified in these areas. Site preparation activities in the unsurveyed area of the proposed SNS site would destroy any historic sites, structures, or features listed on or eligible for listing on the NRHP. If this site were chosen for construction of the SNS, the 35% area would be surveyed and assessed for specific effects prior to the initiation of construction activities. Effects would be mitigated by data recovery.	No effects on historic resources. No historic cultural resources have been identified on or in the vicinity of the proposed SNS site.	A number of earthen features (potentially NRHP-eligible) at Stations 2, 4, 8, and 10 on the SNS site may have been associated with World War I trench warfare training at Camp Upton. They would be destroyed by construction activities. Effects would be mitigated by data recovery.	No effects on historic resources.
No effects on traditional cultural properties (TCPs). No TCPs identified on or in the vicinity of the proposed SNS site.	Five TCPs (prehistoric archaeological sites) within 65% survey area at SNS site would be destroyed by site preparation activities. If any prehistoric archaeological sites are located within the unsurveyed 35% of the SNS (continued on next page)	No effects on TCPs. No TCPs identified on or in the vicinity of the proposed SNS site.		No effects on TCPs.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
7a. Impacts on Cultural Resources (Construction) — continued				
	site, these TCPs would also be destroyed. Because specific identities and locations of other on-site TCPs are not known, potential effects on such specific resources are uncertain.			
7b. Impacts on Cultural Resources (Operations)				
No effects on prehistoric or historic resources. Operational activities would be largely confined to the SNS site. No prehistoric or historic cultural resources have been identified on or in the vicinity of the proposed SNS site.	No effects on prehistoric or historic resources. Operational activities would be largely confined to the SNS site. No prehistoric archaeological sites would be present on the site after construction. No historic cultural resources have been identified on the proposed SNS site.	No effects on prehistoric or historic resources. Operational activities would be largely confined to the SNS site. No prehistoric or historic cultural resources have been identified on the proposed SNS site.	No effects on prehistoric or historic resources. Operational activities would be largely confined to the SNS site. No prehistoric cultural resources have been identified on or in the vicinity of the proposed SNS site. No historic cultural resources would be present on the site after construction.	No effects on prehistoric or historic resources.
No effects on TCPs. No TCPs identified on or in the vicinity of the proposed SNS site.	American Indian tribal groups have identified water resources (surface water and groundwater) as TCPs. See Impacts 2b and 10b for operational effects on these TCPs. Because specific identities and locations of on-site TCPs are not known, potential operational effects on such specific resources are uncertain.	No effects on TCPs. No TCPs identified on or in the vicinity of the proposed SNS site.	No effects on TCPs. No TCPs identified on or in the vicinity of the proposed SNS site.	No effects on TCPs.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
8a. Impacts on Land Use (Construction)				
Introduce large-scale development to the proposed SNS site, utility corridors, and new rights-of-way. Considering that about 64% of the 34,516 acres (13,794 ha) of ORR land is undeveloped, this would be a minimal overall effect. A greenfield site is proposed because no brownfield sites that meet SNS requirements are available.	Introduce large-scale development to the proposed SNS site, utility corridors, and new rights-of-way. Considering the 16,000 acres (6,478 ha) of undeveloped land at LANL, the effect on undeveloped laboratory lands as a whole would be minimal.	Displace the remaining support services operations in the 800 Area. Demolition of the three remaining 800 Area buildings. These would be minimal effects. Introduce large-scale development to Open Space areas due to limited ANL land. Increase the pace of remediation on numerous Solid Waste Management Units (SWMUs) within the proposed SNS site. A beneficial effect would be use of a partial brownfield site for constructing the SNS.	Introduce large-scale development to the proposed SNS site, utility corridors, and new rights-of-way. Considering the large amounts of Open Space land at BNL, the effects would be minimal.	No effects on current land use.
The National Oceanic and Atmospheric Administration/ Atmospheric Turbulence and Diffusion Division (NOAA/ATDD) is conducting the Temperate Deciduous Forest Continuous Monitoring Program (TDFCMP) in the Walker Branch Watershed [0.75 mi. (1.2 km)] east of the proposed SNS site. This long-term program is monitoring the continuous exchange of CO_2, (continued on next page)	No effects on the use of land by environmental research projects. Land on and in the vicinity of the SNS site is not being used for environmental research projects, and none are planned.	No effects on the use of land by environmental research projects. Land on and in the vicinity of the SNS site is not being used for environmental research projects, and none are planned. The ecology plots at ANL are areas of land potentially suitable for ecological research, but little, if any, actual ecological research has ever been conducted in these areas. Currently, there are no on- (continued on next page)	No effects on the use of land by environmental research projects. Land on and in the vicinity of the SNS site is not being used for environmental research projects, and none are planned.	No effects on the use of land by environmental research projects.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
8a. Impacts on Land Use (Construction) — continued				
H_2O vapor, and energy between the deciduous forest and atmosphere. CO_2 from construction vehicles could affect the TDFCMP and one long-term ORNL ecological research project in the Walker Branch Watershed. Potential effects would be loss of CO_2 data quality and data comparability over time.		going or planned ecological projects in Ecology Plots 6, 7, and 8 on the proposed SNS site.		
Potential limitations on future use of the proposed SNS site and land areas adjacent to it.				No effects on future land use.
Reduce the area of ORR land open to recreational deer hunting by 110 acres (45 ha). Effect would be minimal because about 26,406 acres (10,735 ha) would still be open to hunting.	Potential restriction or end of public hiking trail use near the SNS site in TA-70.	No reasonably discernible effects on parks, preserves, and recreational resources. The effects from the proposed action would not be of sufficient scope, magnitude, or duration to alter the key land characteristics that support park, nature preserve, and recreational land uses outside ANL and within the laboratory boundaries.	No reasonably discernible effects on parks, preserves, and recreational resources. The effects from the proposed action would not be of sufficient scope, magnitude, or duration to alter the key land characteristics that support park, nature preserve, and recreational land uses in the vicinity of BNL.	No effects on parks, preserves, or recreational resources.
The proposed SNS would come into view only along the upper reaches of the Chestnut Ridge Road and southwest road accesses to the proposed SNS site. This (continued on next page)	Change views in SNS site area from piñon-juniper woodlands to industrial development. SNS facilities visible to public from points on State Route 4, access road (continued on next page)	The proposed SNS facilities would be visible from points near the ANL fence in the Waterfall Glen Nature Preserve, especially on the west side during late autumn, (continued on next page)	Most visual panoramas in the area around BNL and within the laboratory contain features indicative of development. The proposed action would add the SNS (continued on next page)	No effects on visual resources.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
8a. Impacts on Land Use (Construction) — continued				
effect would be minimal because these roads would be traveled primarily by DOE and ORNL personnel, construction workers, and service providers. It would not be visible to the public from land-based vantage points outside the ORR, most points on the ORR, or frequently traveled roads such as Bear Creek Road and Bethel Valley Road. No established visual resources on the ORR would include the proposed SNS.	to proposed SNS site, the site, and hiking trails in TA-70. Highly visible at night—absence of other lighted facilities. Not visible from White Rock and popular public use areas in Bandelier National Monument.	winter, and early spring. They would also be visible from points within the laboratory boundaries. Because the current views at these locations contain buildings and other features characteristic of development, these effects would be minimal.	facilities to this visual environment, and they would be compatible with it. This effect on visual resources would be minimal.	
8b. Impacts on Land Use (Operations)				
Land use change from Mixed Research/Future Initiatives to Institutional/Research.	Change in current land use from Environmental Research/Buffer to Experimental Science.	Change in current land use from Ecology Plots (Nos. 6, 7, and 8), Support Services, and Open Space to a programmatic land use category specific to SNS operations or Programmatic Mission-Other Areas.	Change in current land use from Open Space to Commercial/Industrial.	No effects on current land use.
CO_2 from SNS stacks would adversely affect TDFCMP (NO_x minimal) and one ORNL research project in the Walker Branch Watershed. (continued on next page)	No effects on the use of land by environmental research projects. Land on and in the vicinity of the proposed SNS site is not being used for environmental research projects, and none are planned.			No effects on the use of land by environmental research projects.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
8b. Impacts on Land Use (Operations) — continued				
H_2O vapor from cooling towers may affect the TDFCMP and two ORNL research projects. Effects would be loss of data quality and data comparability over time.				
No effects on DOE zoning (SNS operations compatible). Through a DOE process called Common Ground and a citizen stakeholder group referred to as the End Use Working Group, citizens in the Oak Ridge area have developed future ORR land use recommendations for DOE. Use of the proposed SNS site for the proposed action would be at variance with recommended Common Ground zoning of the site for Conservation Area Uses. It would also be at variance with an End Use Working Group recommendation advisory to use brownfield sites for new DOE facilities. A greenfield site is proposed for the SNS because no brownfield sites that meet project requirements are available.	No effects on DOE zoning (SNS operations compatible).	The SNS operations would be at variance with Support Services, Ecology Plot No. 8, and Open Space zoning on the SNS site. However, a guiding principle behind ANL zoning is the expansion of other land uses into the Ecology Plots and Open Space. The amount of Support Services land used would be negligible.	The SNS operations would be at variance with Open Space zoning on the SNS site. However, a guiding principle behind BNL zoning is expansion of other land uses into Open Space. Operation of the SNS would probably result in an eventual change in end use zoning of the SNS site and adjacent land from predominantly Open Space to Commercial/ Industrial.	No effects on zoning for future land use.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
8b. Impacts on Land Use (Operations) — continued				
Future adverse CO_2 effects on the TDFCMP and two ORNL research projects. Minimal No_x effects from SNS stacks. Potential future H_2O vapor effects on the TDFCMP and eight ORNL research projects. Potential future effects on strategic ORNL ecological research initiatives. Effects would be loss of data quality and data comparability over time.	No future uses of SNS site and vicinity land for environmental research are planned. As a result, effects on specific future research projects cannot be assessed.	No future uses of SNS site and vicinity land for environmental research are planned. The ecology plots at ANL are areas of land potentially suitable for ecological research, but little, if any, actual ecological research has ever been conducted in these areas. There are no planned environmental research projects in the portions of Ecology Plots 6, 7, and 8 adjacent to the proposed SNS site. As a result, effects on specific future research projects cannot be assessed.	No future uses of SNS site and vicinity land for environmental research are planned. As a result, effects on specific future research projects cannot be assessed.	No effects on the future use of land by environmental research projects.
Potential limitations on future use of the proposed SNS site and land areas adjacent to it.				No effects involving future land use limitations.
Continued restriction of recreational deer hunting on 110-acre (45-ha) SNS site. Effect would be minimal because about 26,406 acres (10,735 ha) would still be open to hunting.	Continued restriction or end of public hiking trail use near the SNS site in TA-70.	No reasonably discernible effects on parks, preserves, and recreational resources. The effects from the proposed action would not be of sufficient scope, magnitude, or duration to alter the key land characteristics that support park, nature preserve, and recreational land uses outside ANL and within the laboratory boundaries.	No reasonably discernible effects on parks, preserves, and recreational resources. The effects from the proposed action would not be of sufficient scope, magnitude, or duration to alter the key land characteristics that support park, nature preserve, and recreational land uses in the vicinity of BNL.	No effects on parks, preserves, or recreational resources.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
8b. Impacts on Land Use (Operations) — continued				
The proposed SNS would come into view only along the upper reaches of the Chestnut Ridge Road and southwest road accesses to the proposed SNS site. This effect would be minimal because these roads would be traveled primarily by DOE personnel, SNS employees, service providers, and visitors to the SNS facilities, including visiting scientists. It would not be visible to the public from land-based vantage points outside the ORR, most points on the ORR, and frequently traveled roads such as Bear Creek Road and Bethel Valley Road. No established visual resources on the ORR would include the proposed SNS.	Change views in proposed SNS site area from piñon-juniper woodlands to industrial development. SNS facilities visible to public from points on State Route 4, access road to proposed SNS site, the site, and hiking trails in TA-70. Highly visible at night—absence of other lighted facilities. Not visible from White Rock and popular public use areas in Bandelier National Monument.	The proposed SNS facilities would be visible from points near the ANL fence in the Waterfall Glen Nature Preserve, especially on the west side during late autumn, winter, and early spring. They would also be visible from points within the laboratory boundaries. Because the current views at these locations contain buildings and other features characteristic of development, these effects would be minimal.	Most visual panoramas in the area around BNL and within the laboratory contain features indicative of development. The proposed action would add the SNS facilities to this visual environment, and they would be compatible with it. This effect on visual resources would be minimal.	No effects on visual resources.
9a. Impacts on Human Health (Construction)				
Based on rates for general industrial construction accidents, 110 potential occupational injuries but less than 1 fatality are predicted.				No effects on human health.
		Due to the preferred location of the SNS within the 800 Area SWMU, construction activities may expose workers to organic compounds and possibly radioactive materials.		

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
9b. Impacts on Human Health (Operations)				
Considering population density and proximity, minimal effects on the health of workers or the public. For operation at 1-MW power, the maximally exposed individual (MEI) would receive an annual radiation dose of 0.40 mrem, or 4% of the 10-mrem limit (40 CFR Part 61). For operation at 4-MW power, the MEI would receive an annual dose of 1.5 mrem, or 15% of the limit. Operation of the SNS at 1-MW power for 10 years and at 4-MW power for 30 years would result in 0.2 latent cancer fatalities (LCFs) in the off-site population attributable to the SNS.	Considering population density and proximity, minimal effects on the health of workers or the public. For operation at 1-MW power, the MEI would receive an annual radiation dose of 0.47 mrem, or 4.7% of the 10-mrem limit (40 CFR Part 61). For operation at 4-MW power, the MEI would receive an annual dose of 1.8 mrem, or 18% of the limit. Operation of the SNS at 1-MW power for 10 years and at 4-MW power for 30 years would result in 0.09 LCFs in the off-site population attributable to the SNS.	Considering population density and proximity, minimal effects on the health of workers or the public. For operation at 1-MW power, the MEI would receive an annual radiation dose of 3.2 mrem, or 32% of the 10-mrem limit (40 CFR Part 61). For operation at 4-MWpower, the MEI would receive an annual dose of 12 mrem, or 120% of the limit. Operation of the SNS at 1-MW power for 10 years and at 4-MW power for 30 years would result in 1.3 LCFs in the off-site population attributable to the SNS.	Considering population density and proximity, minimal effects on the health of workers or the public. For operation at 1-MW power, the MEI would receive an annual radiation dose of 0.91 mrem, or 9.1% of the 10-mrem limit (40 CFR Part 61). For operation at 4-MWpower, the MEI would receive an annual dose of 3.4 mrem, or 34% of the limit. Operation of the SNS at 1-MW power for 10 years and at 4-MW power for 30 years would result in 1.2 LCFs in the off-site population attributable to the SNS.	No effects on human health.
Potential effects on off-site population for combined operations at 1- and 4-MW power. Potential effects on off-site population predicted to maximally exposed individual for initial 1-MW (continued on next page)	Potential effects on off-site population for combined operations at 1- and 4-MW power. Potential effects on off-site population predicted to maximally exposed individual for initial 1-MW (continued on next page)	Anticipated effects on off-site population for combined operations at 1- and 4-MW power. Potential effects on off-site population predicted to maximally exposed individual for initial 1-MW (continued on next page)	Anticipated effects on off-site population for combined operations at 1- and 4-MW power. Potential effects on off-site population predicted to maximally exposed individual for initial 1-MW (continued on next page)	

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
9b. Impacts on Human Health (Operations) — continued				
and upgraded 4-MW operations — 0.2 excess LCFs over 40 years.	and upgraded 4-MW operations — 0.09 excess LCFs over 40 years.	and upgraded 4-MW operations — 1.3 excess LCFs over 40 years.	and upgraded 4-MW operations — 1.2 excess LCFs over 40 years.	No effects on human health.
No observable effects on workers or public from mercury emissions. Mercury levels would be approximately 100,000 times less than OSHA and NIOSH recommendations and the EPA reference concentration for members of the public.				No effects on human health.
9c. Impacts on Human Health (Accidents)				
Extremely unlikely that workers would be exposed to levels of direct radiation that could induce radiation effects. The SNS shield design would be such that with a high-consequence, low-probability design-basis accident, the dose to a maximally exposed individual would be 1 rem in an uncontrolled area and 25 rem for a worker in a controlled area.				No impacts on health.
No effects expected at 1 MW. At 4 MW, only "beyond-design-basis" accident estimated to occur less than once per 1,000,000 years would induce 31 excess LCFs in off-site population.	No effects expected.	No effects expected at 1 MW. At 4 MW, LCFs expected in off-site population for three accident scenarios: one "beyond-design-basis" accident (120 LCFs) occurring less than once per 1,000,000 years; one extremely unlikely accident (2.7 LCFs) occurring between once per 10,000 and once per 1,000,000 years; and one anticipated accident (2.1 LCFs).	No effects expected at 1 MW. At 4 MW, LCFs expected in off-site population for three accident scenarios: one "beyond-design-basis" accident (85 LCFs) occurring less than once per 1,000,000 years; one extremely unlikely accident (1.9 LCFs) occurring between once per 10,000 and once per 1,000,000 years; and one anticipated accident (1.6 LCFs).	No effects on human health.
10a. Impacts on Support Facilities and Infrastructure (Construction)				
Traffic on ORNL access roads would increase approximately 7%. The estimated peak construction workforce of 578 employees (continued on next page)	Traffic on LANL access roads would increase approximately 7%. The estimated peak construction workforce of 578 employees (continued on next page)	Approximately 1 mile (1.6 km) of the existing Westgate Road would have to be relocated to the north in order to circumvent the SNS (continued on next page)	Traffic on BNL access roads would increase approximately 16%. The estimated peak construction workforce of 578 employees would be (continued on next page)	No effects on support facilities and infrastructure.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
10a. Impacts on Support Facilities and Infrastructure (Construction) — continued				
would be expected to add approximately 466 daily round trips and 10 material/service trucks to the total ORNL traffic of 7,810 vehicle trips. Effects on traffic could include increased general congestion on existing access roads to the ORR.	would be expected to add approximately 466 daily round trips and 10 material/ service trucks to the total LANL traffic of 6,980 vehicle trips. Presently, the access route (State Highway 4) to the proposed site is a relatively lightly-traveled road providing access to Bandelier National Monument. Construction traffic would increase traffic on this road by approximately 45%, causing some congestion.	site and replace the existing Westgate Road access to ANL. Traffic on ANL access roads would increase approximately 7%. The estimated peak construction workforce of 578 employees would be expected to add approximately 466 daily round trips and 10 material/ service trucks to the total ANL traffic of 6,290 vehicle trips. Construction traffic would affect the composition and speed of the traffic, resulting in an increase in the general congestion on existing access roads.	expected to add approximately 466 daily round trips and 10 material/service trucks to the projected total BNL traffic of 2,500 vehicle trips. Because of the condition of the access roads to BNL, this increase is not considered significant.	
10b. Impacts on Support Facilities and Infrastructure (Operations)				
Operation of the proposed SNS at 4 MW would add 305 daily round trips and 3 service trucks per day, or a 5% increase over current traffic levels. Effects on traffic could increase general congestion on existing access roads to the ORR.	Operation of the proposed SNS at 4 MW would add 305 daily round trips and 3 service trucks per day, or a 4% increase over current traffic levels. Effects on traffic could increase general congestion on existing access roads to LANL.	Operation of the proposed SNS at 4 MW would add 305 daily round trips and 3 service trucks per day, or a 5% increase over current traffic levels. Effects on traffic could increase general congestion on existing access roads to ANL.	Operation of the proposed SNS at 4 MW would add 305 daily round trips and 3 service trucks per day, or a 12% increase over current traffic levels. Effects on traffic could increase general congestion on existing access roads to BNL. Because of the condition of the access roads to BNL, this increase is not considered significant.	No effects on support facilities and infrastructure.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
10b. Impacts on Support Facilities and Infrastructure (Operations) — continued				
Existing electrical service is adequate for the proposed 1-MW SNS and the 4-MW upgrade. Existing transmission lines would be extended approximately 3,000 ft. Environmental effects of construction the electrical feeder would be negligible.	The existing electrical power system at LANL does not have adequate capacity to meet the demands of the proposed SNS for a 1-MW or 4-MW facility. Meeting these demands would require construction of a 115-kV transmission line from the east side of the site, which would require a major reconfiguration of the system. Additional required efforts could include new power grid configurations and an SNS site-specific power generation station.	The existing electrical power system at ANL has sufficient capacity for the proposed SNS operating at 1-MW power. However, there is not sufficient capacity at ANL for the 4-MW SNS. Sufficient power is available from Commonwealth Edison. Approximately 6,600 ft of new 138-kV transmission line would be constructed to connect the proposed SNS to an adequate substation. The transmission line would be constructed in developed areas, so environmental effects would be minimal.	Existing electrical service at BNL is adequate for the proposed 1-MW SNS. However, in order to accommodate the 4-MW facility, a new 69-kV transmission line would be required extending to the Long Island Lighting Company's (LILCO's) 138-kV grid. This line would be approximately 1 mile in length and would parallel the existing 69-kV line. All upgrades would occur within existing utility corridors; therefore, environmental effects would be minor.	No effects on electrical service.
The existing steam supply at ORNL is adequate to meet the needs of the proposed SNS. If the decision is made to use ORNL steam, approximately 2 miles of steam line would be constructed. Much of the construction would be on previously disturbed land. Environmental effects would be expected to be minimal.	Steam is not available at or in the vicinity of the proposed SNS site. The SNS facility would include steam generation.	The existing steam supply at ANL is adequate to meet the needs of the proposed SNS. If the decision is made to use ANL steam, approximately 1,500 ft of steam line would be constructed, crossing developed land. Environmental effects would be expected to be minimal.	The existing steam supply at BNL is adequate to meet the needs of the proposed SNS. If the decision is made to use BNL steam, approximately 4,000 ft of steam line would be constructed, crossing developed land. Environmental effects would be expected to be minimal.	No effects on the steam supply.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
10b. Impacts on Support Facilities and Infrastructure (Operations) — continued				
The existing East Tennessee Natural Gas 22-in. gas main has adequate capacity to supply the proposed SNS. Approximately 5,000 ft of new gas line would be constructed along Chestnut Ridge Road, the main access road to the proposed site. If the gas line will be on the southwest side of Chestnut Ridge Road, no wetland impacts should occur. If it is on the northeast side of the road, there may be an additional small area of wetland encroachment above that necessary for road construction.	There is adequate capacity from the existing natural gas system at LANL to meet the needs of the proposed SNS. However, there are no existing gas lines in the vicinity of the proposed site. An expansion of the natural gas infrastructure would be necessary.	There is adequate capacity from the existing natural gas system at ANL to meet the needs of the proposed SNS. The natural gas system at ANL is scheduled to be upgraded in FY 1999. A high-pressure gas main is located near the proposed site. Modifications necessary to accommodate the proposed SNS could be accomplished during the scheduled upgrade.	There is sufficient capacity in the existing natural gas system at BNL to meet the needs of the proposed SNS. Approximately 4,000 ft of new gas line would be constructed, primarily across developed land. Environmental effects would be expected to be minimal.	No effects on natural gas system.
The existing 24-in. water main located adjacent to the proposed site has adequate capacity to supply water to the SNS.	The domestic water system at LANL can not meet the projected demands for LANL, including the proposed SNS and the surrounding communities. Accommodating the proposed SNS would require extensive upgrades to the delivery system, including new water mains, lift stations and storage tanks.	The domestic water system at ANL has sufficient capacity to meet the needs of the proposed SNS. In addition, ANL has a non-potable laboratory water supply the could be used for cooling tower makeup.	The domestic water system at BNL has sufficient capacity to meet the needs of the proposed SNS.	No effects on the domestic water system.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
10b. Impacts on Support Facilities and Infrastructure (Operations) — continued				
The existing sewage treatment plant at ORNL has adequate capacity to treat wastes from the proposed SNS.	The existing sewage treatment plant at LANL has adequate capacity to treat wastes from the proposed SNS. The plant is several miles from the proposed site. Sanitary sewage would have to be trucked to the treatment plant or a small package plant included in the SNS facilities.	The existing sewage treatment plant at ANL has adequate capacity to treat wastes from the proposed SNS.	The existing sewage treatment plant at BNL has adequate capacity to treat wastes from the proposed SNS.	No effects on sewage treatment.
11a. Impacts of Waste Management (Construction and Operations)				
Hazardous Wastes <u>Treatment</u> No hazardous waste treatment facilities at ORNL. <u>Storage</u> Projected generation, excluding SNS, 1998–2040: 160 m^3/yr.	**Hazardous Wastes** <u>Treatment</u> No hazardous waste treatment facilities at LANL. <u>Storage</u> Projected generation, excluding SNS, 1998–2040: 942 m^3/yr.	**Hazardous Wastes** <u>Treatment</u> No hazardous waste treatment facilities at ANL. <u>Storage</u> Projected generation, excluding SNS, 1998–2040: 115 m^3/yr.	**Hazardous Wastes** <u>Treatment</u> No hazardous waste treatment facilities at BNL. <u>Storage</u> Projected generation, excluding SNS, 1998–2040: 200 drums/yr.	**Hazardous Wastes**
Total capacity available for SNS wastes: 139 m^3/yr.	Total capacity available for SNS wastes: No long-term storage.			
Amount generated by SNS: 40 m^3/yr.				

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
11a. Impacts of Waste Management (Construction and Operations) — continued				
Hazardous Wastes (cont'd) Conclusion Standard DOE practice has been to dispose of hazardous waste at off-site, DOE-approved, licensed commercial facilities. Implementation of proper handling, disposal, and waste minimization practices would result in minimal effects to the environment.				**Hazardous Wastes (cont'd)** Conclusion No waste generated, thus no effects from SNS on the environment.
Low-Level Radioactive Wastes Treatment Projected generation, excluding SNS, 1998–2040: 282,000 m^3/yr (7.45E07 gal/yr). Total capacity available for SNS wastes: 423,920 m^3/yr (1.12E08 gal/yr).	**Low-Level Radioactive Wastes** Treatment Projected generation, excluding SNS, 1998–2040: 21,880 m^3/yr (5.78E06 gal/yr). Total capacity available for SNS wastes: 4,600 m^3/yr (1.22E06 gal/yr).	**Low-Level Radioactive Wastes** Treatment Projected generation, excluding SNS, 1998–2040: 413,000 m^3/yr (1.09E08 gal/yr). Total capacity available for SNS wastes: 1.00E06 m^3/yr (2.64E08 gal/yr).	**Low-Level Radioactive Wastes** Treatment Projected generation, excluding SNS, 1998–2040: 190 m^3/yr (50,000 gal/yr). Total capacity available for SNS wastes: 300 m^3/yr (70,000 gal/yr).	**Low-Level Radioactive Wastes**
Amount generated by SNS: 16,400 m^3/yr (4.33E06 gal/yr).				
Conclusion No effects on low-level radioactive waste (LLW) treatment facilities would be anticipated, thus no effects to the environment are anticipated.	Conclusion Current treatment facilities do not have the capacity to treat all of the LLW from the proposed SNS. LLW with accelerator-produced tritium would not meet the waste acceptance criteria for the existing LLW treatment facility (RLWTF TA-50). However, a new facility is under construction that will accept these wastes, thus no (continued on next page)	Conclusion No effects on LLW treatment facilities would be anticipated. Tritium discharge would increase from 0.75 Ci/yr to 40 Ci/yr, potentially resulting in minor adverse impacts.	Conclusion SNS volume exceeds capacity. Wastes can be processed at a higher rate. Additional treatment capacity may be necessary, thus production of waste may have minor adverse impacts.	Conclusion No waste generated, thus no effects from SNS on the environment.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
11a. Impacts of Waste Management (Construction and Operations) — continued				
Low-Level Radioactive Wastes (cont'd)	**Low-Level Radioactive Wastes (cont'd)** effects to the environment are anticipated.	**Low-Level Radioactive Wastes (cont'd)**	**Low-Level Radioactive Wastes (cont'd)**	**Low-Level Radioactive Wastes (cont'd)**
Storage Projected generation, excluding SNS, 1998–2040: 2,520 m^3/yr. Total capacity available for SNS wastes: Limited storage available; long-term storage would not be necessary because contracts are in place that would allow for disposal of waste. Amount generated by SNS: 1,026 m^3/yr.	Storage Facilities are under construction for treatment and disposition.	Storage Projected generation, excluding SNS, 1998–2040: 232 m^3/yr. Total capacity available for SNS wastes: 30 m^3 Amount generated by SNS: 1,026 m^3/yr.	Storage Projected generation, excluding SNS, 1998–2040: 283 m^3/yr. Total capacity available for SNS wastes: 270 m^3/yr. Amount generated by SNS: 1,026 m^3/yr.	
Conclusion Additional storage capacity may be necessary to accommodate SNS wastes; however, long-term storage would not be necessary because standard DOE practice has been to dispose of wastes at off-site, DOE-approved, licensed commercial facilities, thus no effects to the environment are anticipated.	Conclusion Long-term storage facilities for LLW are not necessary at LANL. No effects to the environment are anticipated.	Conclusion Additional storage capacity may be necessary to accommodate SNS wastes; however, long-term storage would not be necessary because standard DOE practice has been to dispose of wastes at off-site DOE-approved, licensed commercial facilities. Implementation of proper handling, disposal, and waste minimization practices would result in minimal effects to the environment.		Conclusion No waste generated, thus no effects on the environment.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
11a. Impacts of Waste Management (Construction and Operations) — continued				
Low-Level Radioactive Wastes (cont'd) Disposal No LLW disposal at ORNL, thus no effects on the environment.	**Low-Level Radioactive Wastes (cont'd)** Disposal Projected generation, excluding SNS, 1998–2040: 2,500 m^3/yr. Total capacity available for SNS wastes: 35,000 m^3/yr. Amount generated by SNS: 1,026 m^3/yr. Conclusion No effect on LLW disposal facilities would be anticipated, thus no effects on the environment.	**Low-Level Radioactive Wastes (cont'd)** Disposal No LLW disposal at ANL or BNL, thus no effects on the environment.		
Mixed Wastes Treatment No mixed waste treatment facilities at ORNL, thus no effects on the environment.	**Mixed Wastes** Treatment No mixed waste treatment facilities at LANL, thus no effects on the environment.	**Mixed Wastes** Treatment Projected generation rate, excluding SNS, 1998–2040: 215 m^3/yr. Amount generated by SNS: 18 m^3/yr.	**Mixed Wastes** Treatment No mixed waste treatment facilities at BNL, thus no effects on the environment.	**Mixed Wastes**

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
11a. Impacts of Waste Management (Construction and Operations) — continued				
Mixed Wastes (cont'd	**Mixed Wastes (cont'd**	**Mixed Wastes (cont'd)** Conclusion Design capacity is much greater than anticipated volumes. If necessary, permitted volumes could be increased, thus no effects on the environment.	**Mixed Wastes (cont'd**	**Mixed Wastes (cont'd)**
Storage Projected generation rate, excluding SNS, 1998–2040: 20 m^3/yr.	Storage Projected generation rate, excluding SNS, 1998–2040: 622 m^3/yr.	Storage Projected generation rate excluding SNS, 1998–2040: 215 m^3/yr.	Storage Projected generation rate, excluding SNS, 1998–2040: 2 m^3/yr.	
Long-term storage of SNS waste is not anticipated. Shippable quantities of waste would be transferred to laboratory waste management for transport to a licensed, DOE approved, commercial disposal facility. Amount generated by SNS: 18 m^3/yr.				
Conclusion No effect on mixed waste storage facilities would be anticipated because DOE has contracts in place for disposal of wastes as generated, as per the standard DOE practice of off-site disposal in licensed facilities. Implementation of proper handling, disposal, and waste minimization practices would result in no environmental effects.				Conclusion No waste generated, thus no effects on the environment.
All laboratories have waste certification processes in place to assure LLW and mixed wastes sent to off-site disposal facilities meet the waste acceptance criteria (WAC) of the facility. Because of the uncertainty of the composition of the LLW and mixed waste generated by the SNS, the waste may not meet the current WAC. Pretreatment of the waste at the SNS may be necessary. DOE may have to amend the licenses at the current disposal facilities to allow acceptance of wastes from the SNS.				

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
11a. Impacts of Waste Management (Construction and Operations) — continued				
Sanitary Wastes Treatment Projected generation rate, excluding SNS, 1998–2040: 300,000 gal/day. Total capacity available for SNS wastes: 42,000 gal/day.	**Sanitary Wastes** Treatment Projected generation rate, excluding SNS, 1998–2040: 692,827 m^3/yr. Total capacity available for SNS wastes: 368,000 m^3/yr.	**Sanitary Wastes** Treatment Projected generation rate, excluding SNS, 1998–2040: 350,000 gal/day. Total capacity available for SNS wastes: 150,000 gal/day.	**Sanitary Wastes** Treatment Projected generation rate, excluding SNS, 1998–2040: 800,000 gal/day. Total capacity available for SNS wastes: 1.5 million gal/day.	**Sanitary Wastes**
Amount generated by SNS: 25,900 m^3/yr (18,000 gal/day).				
Conclusion No effect on sanitary waste treatment, thus no environmental impacts are anticipated.				Conclusion No effect on sanitary waste facilities, thus no effects on the environment.
Disposal Projected generation rate, excluding SNS, 1998–2040: 7,645 m^3/yr. Total capacity available for SNS wastes: 1,090,000 m^3/yr.	Disposal Projected generation rate, excluding SNS, 1998–2040: 5,453 m^3/yr. Total capacity available for SNS wastes: Not applicable. Sanitary wastes would be disposed of in off-site landfills.	Disposal Projected generation rate, excluding SNS, 1998–2040 not provided. Total capacity available for SNS wastes: Not applicable. Sanitary wastes would be disposed of in off-site landfills.	Disposal Projected generation rate, excluding SNS, 1998–2040: 1,700 tons/yr. Total capacity available for SNS wastes: Not applicable. Sanitary wastes are disposed of in off-site landfills.	

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
11a. Impacts of Waste Management (Construction and Operations) — continued				
Sanitary Wastes (cont'd) Amount generated by SNS: 1,350 m^3/yr.				**Sanitary Wastes (cont'd)**
Conclusion No environmental effect anticipated.	Conclusion No effect anticipated. Sanitary wastes would be disposed of in off-site landfills, thus no environmental impacts are anticipated.			Conclusion No effect on sanitary waste facilities, thus no environmental impacts are anticipated.
12a. Impacts on Long-Term Productivity of the Environment (Operations)				
Localized effects on groundwater productivity would occur at the ORNL SNS site but not on the corresponding watershed.	Sustained use of groundwater by the SNS over time could lower water levels in wells and reduce long-term main aquifer productivity.	Localized effects on groundwater productivity would occur at the ANL SNS site but not on the corresponding watershed.		No effects on groundwater productivity.
Permanent commitment of 110 acres (45 ha) of forested land to the SNS. This represents less 0.5% of the forested area on the ORR.	Permanent commitment of 110 acres (45 ha) of piñon-juniper habitat to the SNS. This represents approximately 10% of the piñon-juniper habitat in TA-70.	Permanent commitment of 110 acres (45 ha) of land to the SNS. A large portion of this land has been previously disturbed.	Permanent commitment of 110 acres (45 ha) of land to the SNS. This represents less than 2% of the legally established Pine Barrens Protection Area. The proposed SNS site is entirely within the Compatible Growth Area.	No effects on the long-term productive potential of land.
13a. Cumulative Impacts (Construction and Operations)				
The proposed action would contribute to cumulative impacts through localized radionuclide contamination of groundwater.				This alternative would not contribute to cumulative impacts involving radionuclide contamination of groundwater.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
The potential cumulative impact of incremental emissions would be evaluated and permitted on a case-by-case basis by the state and federal air quality agencies at the appropriate juncture in order to protect public health and welfare.				This alternative would not contribute to cumulative impacts on incremental emissions.
No cumulative impacts are predicted for noise.				This alternative would not contribute to cumulative impacts on noise.
The proposed action would not contribute to cumulative impacts on terrestrial resources.	The proposed action would not contribute to cumulative impacts on terrestrial resources.	Clearing 15% of the undeveloped land at ANL for the SNS and APS would significantly decrease the terrestrial wildlife inhabiting ANL. Except for fallow deer, no rare or important game animals would be affected.	The proposed action would not contribute to cumulative impacts on terrestrial resources.	This alternative would not contribute to cumulative impacts on terrestrial resources.
Cumulative impacts on wetlands would be minimal because wetlands would be created or restored to replace those lost to construction.				This alternative would not contribute to cumulative impacts on wetlands.
No cumulative impacts are anticipated on aquatic resources.				This alternative would not contribute to cumulative impacts on aquatic resources.
Cumulative impacts on protected species would be expected to be minimal.				This alternative would not contribute to cumulative impacts on protected species.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
The activities at ORNL account for only about 7% of the employment, wage and salary, and business activities of the area. Cumulative impacts of SNS on the economy, housing, and community infrastructure would be minimal.	The activities at LANL account for about one-third of the employment, wage and salary, and business activities of the area. Some positive benefits would occur in the form of new jobs but cumulative impacts of SNS on the economy, housing, and community infrastructure would be minimal overall.	The activities at ANL account for much less than 1% of the employment, wage and salary, and business activities of the area. Cumulative impacts of SNS on the economy, housing, and community infrastructure would be minimal.	The activities at BNL account for much less than 1% of the employment, wage and salary, and business activities of the area. Cumulative impacts of SNS on the economy, housing, and community infrastructure would be minimal.	No cumulative impacts on the economy, housing, and community infrastructure.
There would be no cumulative impacts involving environmental justice issues.				This alternative would not contribute to cumulative impacts involving environmental justice issues.
The proposed action would not contribute to cumulative impacts on prehistoric cultural resources.	Twenty prehistoric archaeological sites in the 65% surveyed area would be destroyed by construction of the proposed SNS and expansion of LLW Disposal Facility in TA-54. The potential contribution of the other 35% of the proposed SNS site cannot be accurately assessed. If the proposed SNS site is chosen for construction of the SNS, this area would be surveyed and assessed for cumulative impacts on prehistoric cultural resources prior to construction.	Prehistoric site 40DU207, adjacent to the proposed SNS site, may be disturbed or destroyed by SNS construction. ANL has not assessed the NRHP eligibility of this site. Site 40DU189 on the Advanced Photon Source (APS) site was once thought to be potentially NRHP-eligible, but it was later determined to not be a prehistoric cultural resource. If 40DU207 is a cultural resource, the proposed action, along with the APS project, (continued on next page)	The proposed action would not contribute to cumulative impacts on prehistoric cultural resources.	This alternative would not contribute to cumulative impacts on prehistoric cultural resources.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
		would not contribute to cumulative impacts on prehistoric cultural resources at ANL because 40DU189 is not a prehistoric cultural resource.		
The proposed action would not contribute to cumulative impacts on historic cultural resources.	Implementation of the proposed action within the 65% surveyed area at the proposed SNS site would not contribute to cumulative impacts on historic cultural resources. The potential contribution of the other 35% cannot be accurately assessed. If this site is chosen for construction of the proposed SNS, this area would be surveyed and assessed for cumulative impacts on historic cultural resources prior to construction.	The proposed action would not contribute to cumulative impacts on historic cultural resources.		This alternative would not contribute to cumulative impacts on historic cultural resources.
The proposed action would not contribute to cumulative impacts on TCPs.	Cumulative impacts on 20 prehistoric archaeological sites (all TCPs) destroyed by construction of the proposed SNS and expansion of LLW Disposal Facility in TA-54. If any prehistoric archaeo-logical sites are located (continued on next page)	The proposed action would not contribute to cumulative impacts on TCPs.	The proposed action would not contribute to cumulative impacts on TCPs.	This alternative would not contribute to cumulative impacts on TCPs.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
	within the unsurveyed 35 percent of the proposed SNS site, these TCPs would also be destroyed during construction. Cumulative impacts on water resources are also impacts on TCPs (see related entries under this table heading). Because specific identities and locations of TCPs at sites of the proposed SNS and other analyzed actions are not known, cumulative impacts on such specific resources would be uncertain.			
The proposed action would contribute minimally to cumulative impacts on undeveloped ORR land.	The proposed action would contribute minimally to cumulative impacts on undeveloped LANL land.	The SNS and APS would introduce development to about 160 acres (65 ha) of undeveloped land. This would reduce the already limited area of undeveloped ANL land available for development by about 15%.	The proposed action would contribute minimally to cumulative impacts on undeveloped land at BNL.	This alternative would not contribute to cumulative impacts on undeveloped land.
The proposed action would contribute minimally to cumulative impacts on areas of ORR land in current use categories.	The proposed action would contribute minimally to cumulative impacts on areas of LANL land in current use categories.	The SNS and APS would reduce Open Space land at ANL by 145 acres (59 ha). This would further reduce the already limited area of Open Space ANL land available for development by about 15%.	The proposed action would contribute minimally to cumulative impacts on areas of BNL land in current use categories.	This alternative would not contribute to cumulative impacts on areas of land in current use categories.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
The proposed action, CERCLA Waste Disposal Facility, Parcel ED-1, and JINS would reduce the environmental research potential of 981 acres (391 ha) of National Environmental Research Park (NERP) land on the ORR. This cumulative impact would be minimal because only 4.5% of the NERP land on the ORR would be affected. The cumulative impacts of these actions on environmental research projects are uncertain.	The proposed action, construction of a new LLW disposal facility in TA-67, and construction of a new road to support pit production would reduce the environmental research potential of 177 acres (72 ha) of NERP land. This cumulative impact would be Minimal because only 0.6% of the NERP land at LANL would be affected. The land on and in the vicinity of the proposed SNS site is not being used for environmental research projects. As a result, the proposed action would not contribute to cumulative impacts on uses of the land by environmental research projects. Because no future environmental research projects are planned for this land, cumulative impacts on specific future projects cannot be assessed.	No NERP land is present at ANL. Consequently, the proposed action would not reduce the environmental research potential of NERP land. The land on and in the vicinity of the proposed SNS site, including Ecology Plot Nos. 6, 7, and 8, is not being used by environmental research projects. As a result, the proposed action would not contribute to cumulative impacts on the use of land by such projects. Because no future environmental research projects are planned for this land, cumulative impacts on specific future projects cannot be assessed.	No NERP land is present at BNL. Consequently, the proposed action would not reduce the environmental research potential of NERP land. The land on and in the vicinity of the proposed SNS site is not being used by environmental research projects. As a result, the proposed action would not contribute to cumulative impacts on the use of land by such projects. Because no future environmental research projects are planned for this land, cumulative impacts on specific future projects cannot be assessed.	No cumulative impacts on NERP land or environmental research projects.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
The SNS and CERCLA Waste Management Facility [White Wing Scrap Yard (high-end scenario)] would be collectively at variance with Common Ground zoning for future use of their sites in Conservation Area Uses.	The proposed action would not contribute to cumulative impacts on zoning of land for future use.			This alternative would not contribute to cumulative impacts on zoning of land for future use.
The proposed action would contribute minimally to cumulative impacts on recreational land use but not at all on parks and preserves.				This alternative would not contribute to cumulative impacts on parks, preserves, or recreational land uses.
The proposed action would not contribute to cumulative impacts on visual resources.	The proposed action would not contribute to cumulative impacts on visual resources.	Current views within ANL and along the ANL fence inside the Waterfall Glen Nature Preserve already contain buildings and other features characteristic of development. Consequently, the cumulative impacts of the SNS and APS facilities on visual resources would be minimal.	The proposed action would not contribute to cumulative impacts on visual resources.	This alternative would not contribute to cumulative impacts on visual resources.
Minimal cumulative radiological impacts on human health from normal ORNL and SNS operations.	Minimal cumulative radiological impacts on human health from normal LANL and SNS operations.	Potential for adverse radiological impacts on human health from normal ANL and SNS operations.	Potential for adverse radiological impacts on human health from normal BNL and SNS operations.	This alternative would not contribute to radiological impacts on human health.
Minor increases in traffic due to the proposed SNS project and development of Parcel ED-1 may minimally reduce the level of service on roads.	Minimal cumulative impacts on transportation.			This alternative would not contribute to cumulative impacts involving transportation.

Table S 1.7.2-1. Comparison of impacts among alternatives (continued).

PROPOSED ACTION				NO-ACTION ALTERNATIVE
ORNL Alternative	**LANL Alternative**	**ANL Alternative**	**BNL Alternative**	
13a. Cumulative Impacts (Construction and Operations) — continued				
Minimal cumulative impacts on electric power supply capabilities.	The power demand of the SNS, DAHRT facility, and continued LANL operations would exceed the delivery capacity of the electric power pool that serves the laboratory.	Adequate power is available, but new power lines would need to be installed.	Minimal cumulative impacts on electric power supply capabilities.	This alternative would not contribute to cumulative impacts on electric power supply capabilities.
Waste management facilities at ORNL, LANL, ANL, and BNL have sufficient capacity to handle the waste volume projected for the period 1998–2040, including the wastes from the proposed SNS. Additionally, standard DOE practice has been to dispose of hazardous waste at off-site DOE-approved, licensed facilities. Therefore, construction and operation would have a minimal contribution to cumulative impacts on waste management facilities.				This alternative would not contribute to cumulative impacts on waste management.